12. End-to-End Scenario Group

The objective of the End-to-End Scenario Group is to verify that the ECS, as a “whole”, operates properly and can provide the full range of required functional capabilities for users and operators during the Release B time frame. This section confirms the ECS capabilities to support "all-up" multi-site, multi-mission operations and typical "day-in-the-mission-life" scientist activities. The scenarios verify that the ECS can support broad, multi-site, multi-mission interactive operations in support of mission planning, scheduling, and real-time operations as well as science data ingest, archiving, processing, and distribution. Interfaces between the ECS and external systems that support AM-1 mission operations are verified. Varying degrees of science data operations for the following missions and instruments are confirmed: TRMM (CERES, LIS, PR, TMI, and VIRS instruments), Landsat 7 (ETM+ instrument), AM-1 (ASTER, CERES, MISR, MODIS, and MOPITT instruments), ADEOS II (SeaWinds instrument), RADAR ALT (DFA and MR instruments), METEOR (SAGE III instrument), Flights of Opportunity (COLOR and ACRIM instruments), ERS-1, ERS-2, JERS-1, and RADARSAT (SAR instruments). Most of the interfaces and data flows depicted earlier in Figure 7-1 and tabulated in Table 7-1 are verified in the execution of these scenarios. The capabilities to process Data Acquisition Requests (DARs) for the AM-1 ASTER instrument, generate products on demand, and perform data set transfers involving multiple sites are verified.

Figure 12-1 illustrates scenarios and associated capabilities of the End-to-End Scenario Group. It depicts ECS capabilities to communicate and coordinate among the EOC, SMC, ECS DAACs, and SEDAC. Interfaces between these ECS sites and external systems such as EDOS, EBnet, FDF, NCC, TSDIS, SDPF, ASTER GDS, LPS, NOAA ADC, and SCFs, as applicable, are also included. Figure 12-1 shows the ECS capabilities to provide science data ingest, processing, archiving, and access for LIS, CERES, ASTER, MISR, MODIS, MOPITT, SeaWinds, MR, DFA, SAGE III, COLOR, and ACRIM instruments. Also included are science product ingest, archiving, and access for PR, TMI, VIRS, and ETM+ instruments, and for ERS-1, ERS-2, JERS-1, and RADARSAT missions. The capabilities for planning, commanding, controlling, and analyzing the AM-1 spacecraft and its instruments, as well as the capability for ECS to interoperate with the Version 0 system, the NOAA ADC, and ASTER GDS are illustrated. Performance tests and performance analyses complement the multi-site and mission support tests to ensure that the ECS meets current and projected system performance requirements.

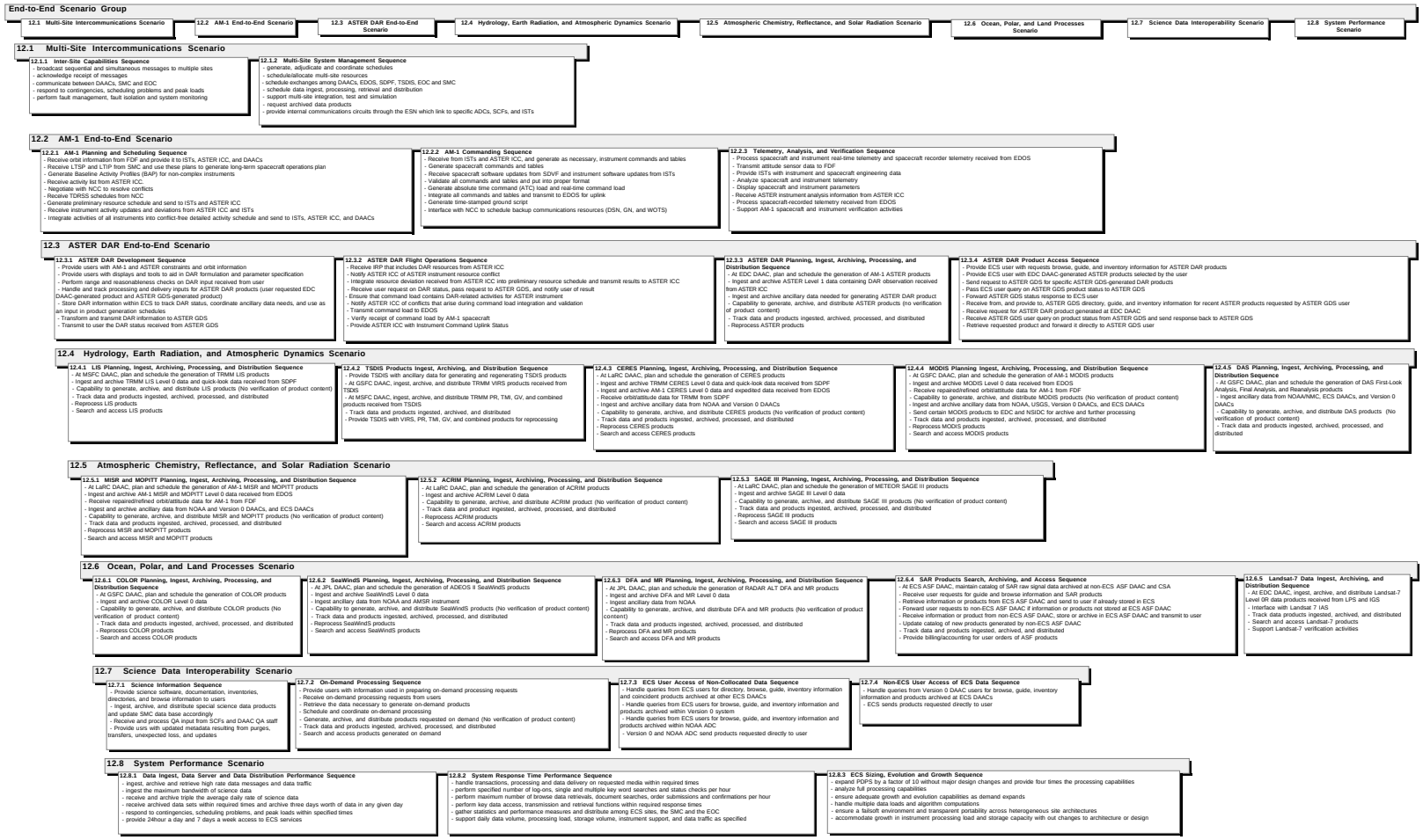

FIGURE 12-1. End-to-End Scenario Group Acceptance Test Sequencing

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This scenario group concentrates on extending the functional verification performed in executing the scenarios described in Sections 8 through 11. Replication of mission critical functions is performed to provide increased confidence that the ECS can meet level 3 requirements. The scenarios are based on the ECS mission baseline, site-specific mission objectives, and global change science disciplines. Details concerning test inputs have been obtained from the ECS Technical Baseline, operations concepts, and science scenarios. Where possible, actual interfaces and existing, real data would be used during acceptance testing conduct. In many cases, however, simulated data streams and/or interfaces are used due to the immaturity or unavailability of the interfacing systems or data sets. Execution of the test cases included in this scenario group is performed primarily at the EOC, SMC, and ECS DAACs. For SEDAC, however, the ECS provides software but no integration, hardware, maintenance, or operational services.

12.1 Multi-Site Intercommunications Scenario

The Multi-Site Intercommunications Scenario verifies the ECS capability for handling complex data product orders that require supporting data from multiple sites. Message broadcasting, multi-site system management, and inter-site network communications involving data transfer among different sites are confirmed. The sites send multiple messages among themselves to confirm capabilities to support interactive message traffic among the ECS DAACs, between the DAACs and the SMC, between the SMC and EOC, and between the EOC and DAACs using EBnet or NOLAN. Interface capabilities between applicable ECS sites and EDOS, Version 0, NOAA ADC, and SEDAC are also verified in this scenario. This scenario also confirms the SMC capability to support system-wide schedule generation, coordination, and adjudication.

12.1.1 Inter-Site Capabilities Sequence

The Inter-Site Capabilities Sequence verifies that the ECS transmits and handles concurrent multiple data messages. This sequence of tests confirms the capability of the DAACs, as well as the SMC, to receive and handle broadcast messages. To perform these tests, an operator broadcasts a data request message to each of the eight DAACs, the SMC and the EOC. Each site receiving a message sends an acknowledgment of proper receipt of the message. The received messages are compared with those sent to check that they are identical and to confirm the integrity of the ECS message broadcasting capability. The capability to send and receive a sequential set of messages over an extended period is also tested. This sequence verifies that ECS supports the SN by way of EDOS/EBnet to obtain forward and return link data communications. The ability to perform fault management, fault isolation, and monitoring is also verified.

The next set of tests confirms the ECS capability to provide users/operators at each DAAC and the SMC to broadcast messages to and acknowledge receipt of messages from the other sites. Users/operators at each DAAC broadcast messages to the other DAACs and the SMC and receive message receipt acknowledgments. Subsequently, an operator at the SMC broadcasts a message to each of the DAACs and confirms, via receipt of acknowledgment messages and by message comparison, the inter-site ECS broadcasting capability. Similarly, the transfer, receipt and proper interpretation of a set of sequential messages from and to each site is verified.

Message traffic to/from the EOC, eight DAACs and the SMC is verified. Message traffic includes coordination and scheduling information between multiple sites. This sequence also verifies that ECS receives from the science community science software, software fixes, instrument calibration data, integration support requests, metadata for special products archiving, data transfer requests (inventories, directories, and browse), data quality/instrument assessment, instrument operations information, and ancillary data. This sequence verifies that each DAAC is capable of responding to contingencies, scheduling problems, and peak loads.

12.1.1.1 Test Case B120110.010-Inter-DAAC and DAAC-SMC Communications

The Inter-DAAC and DAAC-SMC Communications test case verifies the capabilities of the ECS DAACs to sequentially send messages among themselves and to the EOC and SMC, and also to receive and process acknowledgments of proper message receipt. Each ECS DAAC user/operator sequentially and then concurrently broadcasts data request messages to each of the other seven DAACs and to the SMC. The interfaces between the DAACs and the EOC are also tested.

Each DAAC sends to remote DAACs the following data, as applicable: L0-L4, metadata, ancillary, calibration, correlative, documents, science software and spacecraft and instrument logs. Messages in proper format for transmission among the DAACs, the EOC and the SMC are required to test the interfaces among these entities. The test performs sequential message transmission, specifying the order and time of each transmission. Sequential messages are transmitted to the eight DAACs, to the SMC and to the EOC. The Demonstration and Test methods are used to verify these capabilities.

The expected results include the receipt by each of the other DAACs, the EOC and the SMC of the transmitted messages and the receipt by the corresponding entity of message receipt acknowledgment messages. The inter-DAAC, DAACs to SMC and DAACs to EOC message communications capabilities are verified.

Proper receipt of the transmitted messages, proper acknowledgments transmitted to the senders of message receipt, as well as, verification of the overall ECS capability to support inter-DAAC communications of individual and sequential message transmissions are confirmed.

12.1.1.2 Test Case B120110.020-SMC, DAACs, EOC and Spacecraft Communications

The SMC, DAACs, EOC and Spacecraft Communications test case verifies the SMC capability to send sequential messages to the EOC and each ECS DAAC. An SMC operator establishes communications with the eight DAACs and the EOC, sends a set of sequential messages to each, and confirms proper message receipts and acknowledgments. This test case also exercises the capability of ECS to respond to contingency and scheduling problems. This test case exercises the capability of ECS to support the SN via the EDOS/EBnet to obtain forward and return link data communications. For example, the capability to communicate forward and return link data communications through the TDRSS via the EDOS/EBnet interface to and from the spacecraft is verified in this test case. This test case also verifies the EDOS-EOC interface capability to

transfer TDRSS Service Session (TSS) Summary Reports from EDOS to the EOC following completion of each TSS. The Demonstration method is used to verify these capabilities.

To exercise these capabilities, messages in the proper format are sent from the SMC to the EOC and from the SMC to the eight DAACs. This test confirms successful SMC message transmission and the receipt of acknowledgement messages from the EOC and DAACs indicating that the messages were received and properly interpreted.

The expected results include the successful receipt of messages by the EOC and the eight DAACs, as well as, proper response of ECS to respond properly to contingency problems and peak loads.

12.1.1.3 Test Case B120110.030-ECS, NCC, and the EDOS/EBnet Interface Communications

The ECS, NCC, and the EDOS/EBnet Interface Communications test case verifies the ECS capability to communicate with the NCC via the EBnet interface. This communication includes the capability of ECS: to send TDRSS schedule requests and other non-telemetry data messages (non-telemetry data messages include status and reconfiguration messages) to the NCC; and receive schedule messages, schedule result messages, and other non-telemetry data messages from the NCC via EBnet. This test case also verifies the capability of ECS to communicate with NCC to coordinate support from the Ground Network (GN), Deep Space Network (DSN), or Wallops Orbital Tracking Station (WOTS) using the EDOS/EBnet interface. The capability of ECS to communicate with GN, DSN, and WOTS for transmitting commands to EOS spacecraft and obtaining return link telemetry data and non-telemetry data from EOS spacecraft is verified. This test also confirms the sending and receiving of messages from NCC and the successful receipt of scheduling and planning information from the FDF.

This test case also verifies the capability of ECS to communicate with the FDF via the EBnet interface. This includes the ability of ECS to receive planning and scheduling information for the EOS spacecraft and instruments from the FDF for FDF institutional products and AM-1 mission specific products. The Demonstration method is used to verify these capabilities.

To exercise these capabilities, schedule messages, non-telemetry data messages, as well as other communication messages in the proper format are used.

The expected results are for the EBnet to support communication among ECS, NCC, and EDOS.

12.1.1.4 Test Case B120110.040-ECS and NOLAN Communications

The ECS and NOLAN Communications test case verifies the capability of the ECS to receive notification and information concerning the quality of NOLAN services between ECS and its users. For example, this test case verifies that ECS receives the following: notification of faults or security breaches in the NOLAN network, information regarding fault status in the NOLAN network and estimated repair time or resolution time, and periodic summary information concerning faults, as well as, periodic information regarding network performance of NOLAN. This test also verifies the ability of ECS to send to NOLAN information concerning security

breaches at ECS facilities that may affect NOLAN and other EOSDIS sites. The Test method is used to verify these capabilities.

To exercise these capabilities, notification and information messages are required in the proper format.

This test confirms that ECS receives information about the status of the NOLAN and ECS sends NOLAN notifications of security breaches at ECS sites.

12.1.1.5 Test Case B120110.050-End-to-End Operations and Fault Management

The End-to-End Operations and Fault Management test case verifies the capabilities of ECS elements to perform the following functions: EOS mission planning and scheduling, EOS mission operations, command and control, communications and networking, data input, data processing, data storage, data distribution, information management, end-to-end fault management, and system management. Furthermore, this test case verifies the capability of each ECS element to support end-to-end system testing and fault isolation, as well as, the capability to monitor each ECS element during testing. This test verifies two modes of operation: on-line operational mode and off-line test mode for fault detection and isolation. These modes enable ECS elements to achieve the specified operational availability requirements. The Test method is used to verify these requirements.

To exercise these capabilities schedule messages, non-telemetry data messages, as well as, other communication messages in the proper format are required. Messages in proper format for transmission among the DAACs, the EOC and the SMC are used. Mission planning and scheduling information, as well as, simulated command and control information is required.

This test confirms that ECS elements are capable of supporting end-to-end test and verification activities including during pre-launch, spacecraft verification, flight operations, and instrument verification phases. The two modes of operation are confirmed, as well as, the end-to-end functions described above.

12.1.1.6 Test Case B120110.060-Receipt of Data from the Science Community

The Receipt of Data from the Science Community test case verifies the capability of the ECS to receive, from the ECS science community, the following: science software; software fixes; instrument calibration data; integration support requests; metadata for special products archiving; data transfer requests for inventories, directories, and browse data; data quality and instrument assessment data; instrument operation information; and ancillary data. The ECS science community includes: team leaders (TLs), team members (TMs), principle investigators (PIs), and co-investigators (CoIs).

To exercise these capabilities, the following data is required: science software; software fixes; instrument calibration data; integration support requests; metadata for special products archiving; data transfer requests for inventories, directories, and browse data; data quality and instrument assessment data; instrument operation information; and ancillary data. The Test method is used to verify this capability.

This test confirms that ECS receives the above mentioned data from the ECS science community.

12.1.1.7 Test Case B120110.070-Secure Interfaces

The Secure Interfaces test case verifies that FOS is isolated with secure interfaces. The test also verifies that IST users not within FOS facilities communicate with secure interfaces by using only a data integrity service.

The input to this test are all the interfaces to FOS the EBnet, as well as a data integrity service.

The expected results are that FOS is isolated using secure interfaces and that a data integrity service is provided for IST users.

12.1.2 Multi-Site System Management Sequence

The Multi-Site System Management Sequence builds on earlier scheduling capability tests performed in Sections 8 and 9. In this sequence the emphasis is on multi-site coordination and support of sequential scheduling actions. This sequence confirms the capability of the ECS to provide broad system-wide schedule generation, adjudication, and coordination. This sequence demonstrates the capabilities of the ECS to exchange schedule and product delivery data and information among ECS sites and with external entities, for use in ECS resource management. The ability to interface with the EOC for coordination of EDOS provided services, as well as, the ability of EOC to support the scheduling of interface and end-to-end tests with external elements is verified. The capability of ECS elements to exchange element level status data with EDOS is also verified in this sequence. The ability to use and support the EDOS/EBnet interface to obtain the data capture, data archival, and data distribution services needed to achieve full end-to-end ECS functionality is verified.

This sequence of tests verifies the capability of the ECS to support multi-site scheduling of activities related to AM-1 instrument data ingest, processing, retrieval and distribution and to support interfaces. This sequence also verifies the capability to interface and exchange schedule related messages and other data among the eight DAACs, EDOS, SDPF, TSDIS, and NOAA ADC. Other data refers to the following: L0-L4, metadata, ancillary data, calibration data, correlative data, documents, science software, spacecraft and instrument logs and software fixes.

The capabilities to provide internal communications interfaces to GFE circuits and ISO/OSI data communications protocols and services to external interfaces, as required by IRDs, are verified. The ability of the ECS to support: interactive sessions, non-interactive remote sessions, client server interfaces, and sessions for training purposes is also verified. The EBnet provides PSCN circuits which link to specified ADCs, selected Earth Probe Data Systems (EPDSs), selected ISTs, and DAACs.

The capability of the ECS to support multi-site integration, test and simulation activities, send schedule directives, and coordinate and adjudicate system resource scheduling conflicts is also verified. This sequence of tests also verifies that each ECS site properly interfaces with other ECS sites and entities external to ECS.

12.1.2.1 Test Case B120120.010-Schedule Generation, Coordination, and Adjudication Support

The Schedule Generation, Coordination, and Adjudication Support test case verifies the ECS capabilities to support system resource allocation and schedule generation in support of ECS missions. Coordination among a number of ECS elements and external entities is required to develop a coordinated schedule among ECS systems and interfacing entities. An ECS operator communicates schedule related data and decisions among ECS systems and interfacing entities. For example, the ability of the EOC to interface with EDOS for coordinating EDOS services required by EOC is verified. Also, the ability of the EOC to participate in the scheduling of end-to-end tests with external elements is verified. External elements include: ICCs, spacecraft simulators, NCC, FDF, and EDOS. The Demonstration method is used to verify these requirements.

To exercise these capabilities, a set of schedule-related information and data, as well as a set of procedures and protocols describing the processes and responsibilities for schedule development and maintenance are required. Also needed are schedule generation operational scenarios defining a typical mission related schedule generation process, including the parameters being scheduled, the resources being allocated, and the overall responsibility among the different EOSDIS entities for schedule decision-making and control. Additional requirements include prototype scheduling directives and associated adjudication procedures to test the capability to exchange this information and develop an adjudicated schedule.

This test verifies that the ECS: exchanges relevant schedule and resource data with external entities; generates schedule related inputs; coordinates among the responsible parties in supporting development of an overall EOSDIS schedule; and communicates and negotiates scheduling conflicts.

12.1.2.2 Test Case B120120.020-AM-1 Data Handling and Resource Scheduling Support

The AM-1 Data Handling and Resource Scheduling Support test case verifies the ECS capabilities to support users in specific mission resource scheduling. In particular, support in scheduling data ingest, data processing, data retrieval and data distribution activities is verified. The use of the EDOS/EBnet interface to obtain the data capture, data archival, and data distribution services required to archive full end-to-end functionality is also verified. The requirements to communicate and coordinate schedules among the DAACs and with EDOS, EBnet, and other facilities in supporting Release B missions are verified.

Also verified are the capabilities of ECS elements that interface with EOSDIS to exchange element level status data with EOSDIS. Schedule coordination with the NOAA ADC in support of earth science resource data exchange among scientists is also verified. This test case also verifies that an ECS interface is provided to ADC and ODC data systems and archives that produce, process, and/or maintain Earth science data sets and have agreed to make information and services available to ECS. This test case also verifies that ECS sends the following to ADCs: L0-L4 data, metadata, ancillary data, calibration data, correlative data, documents,

science software, as well as spacecraft and instrument logs. The Test and Demonstration methods are used to verify these requirements.

To execute this test typical timelines of the AM-1 mission activities, with required resources to perform the necessary data processing and storage activities, as well as element-level status associated with each resource, are required. Also required are the proper protocols and message formats to communicate resource information among the DAACs, EDOS, EBnet, and other systems. Other inputs are product delivery schedules and status information about products, as well as, defined benchmark tests and test data sets for system verification and data quality evaluation. Finally, a set of user resource scheduling requests and coordination messages developed in response to the mission timelines are required to execute the mission-related scenarios.

The expected results from this test are verifications of the requirements to support testers/users related to data ingesting, processing, storing and retrieving activities. Also verified is the capability to coordinate resource scheduling and allocation among the DAACs, EDOS, EBnet, and other facilities. Another expected result is the successful receipt of the delivery schedules and delayed products status information from ECS systems.

12.1.2.3 Test Case B120120.030-SMC Support to Integration, Test and Simulation Activities

The SMC Support to Integration, Test and Simulation Activities test case verifies the SMC capabilities to support ECS integration, test and simulation activities. The SMC supports system integration and test by controlling system access, managing system resources, tracking and reporting system faults and gathering and reporting system performance statistics. The SMC must support user simulation activities in accepting system inputs and providing necessary system responses and operations control. The Demonstration method is used to verify the ability of the SMC to support integration, test and simulation activities.

To exercise these capabilities, a list of the required support functions of the SMC is needed. In order to perform system integration, test, and simulations, the test team utilizes a set of integration and test scripts and system exercises that utilize these SMC capabilities.

The expected result is the verification that the SMC provides the necessary system support functions to foster effective ECS integration, test and simulation activities.

12.1.2.4 Test Case B120120.040-EOC / EDOS Interface

The EOC / EDOS Interface test case verifies the capabilities of the EOC to communicate with EDOS. This test case verifies that the EOC receives real time return link data, operations management data, mission data sets, customer operations data accounting data (CODA) and TSS summary reports, operations management test data sets, return link real-time path service EDOS data units (EDU), and command link control words (CLCWs) EDUs from EDOS. CODA reports are transferred to EGS elements receiving real-time forward or return link services. These reports contain data describing the status of services provided by EDOS and EBnet during the TSS. This test case also tests the capability of EGS elements to receive the CODA reports.

Furthermore, this test case verifies the capability of EOC to send real time forward link data such as, forward link real-time command link transmission units (CLTUs), operations management data, as well as, mission test data sets, and operations management test data sets. The Test method is used to verify these requirements.

The inputs to this test case are real-time return link and forward link data, operations management data and test data sets, mission data sets, return link real-time path service EDOS data units (EDU), command link control words EDUs from EDOS and forward link real-time CLTUs.

The expected results are that EOC receives CODA reports, TSS summary reports, return link data, CLCWs, operations management data, mission test data sets, and return link real-time path service EDUs.

12.2 AM-1 End-to-End Scenario

The AM-1 End-to-End Scenario verifies the ECS capability to provide end-to-end mission operations and support verification activities for the AM-1 platform and its instruments. It covers the full scope of activities related to planning and commanding the AM-1 spacecraft and instruments.

The focal point of this scenario is the EOC, which is the planning, scheduling, command, and control center for the AM-1 spacecraft and four instruments, i.e., CERES, MISR, MODIS, and MOPITT. The EOC provides ICC services for these instruments. On the other hand, the ASTER instrument is controlled by the ASTER ICC in Japan. Nevertheless, all ASTER activities are integrated with the other AM-1 instruments and spacecraft by the EOC.

This scenario, which builds upon the methodical, detailed verification of AM-1 flight operations capabilities described in Section 11, includes performing an end-to-end sequential set of mission support operations involving numerous interfaces between the EOC and the NCC, FDF, EDOS, SDVF, and ASTER ICC. Activities involving the CERES, MISR, MODIS, and MOPITT ISTs are also included.

The scenario confirms the capability of the ECS to support sequential flight operational activities that are performed during a "day in the life" of the AM-1 mission, including planning and scheduling, communications coordination, command management, command uplink, telemetry receipt and processing, and health and safety monitoring. Also demonstrated are end-to-end mission planning, scheduling and commanding, while also supporting background mission plan and resource schedule development.

Included herein are the ECS capabilities to access stored mission data and plans, develop mission activity profiles and schedules, coordinate with the NCC for Tracking and Data Relay Satellite System (TDRSS) uplink and downlink services and backup services when TDRSS is unavailable, obtain necessary orbit and attitude data from the FDF, coordinate with the ASTER ICC, and generate and transmit AM-1 command sequences to EDOS via EBnet.

12.2.1 AM-1 Planning and Scheduling Sequence

The AM-1 Planning and Scheduling Sequence verifies that the ECS provides the capability to integrate plans, activities, and resources for the AM-1 spacecraft, its instruments, and related ground operations so that science data can be scheduled for collection. This sequence verifies that the EOC integrates information on spacecraft and instrument resources and activities with FDF and NCC information and generates preliminary schedules and detailed activity schedules. In support of these capabilities, the EOC interfaces with the FDF, NCC, ASTER ICC, non-complex instrument ISTs, and to a lesser extent the SMC.

The EOC receives predicted orbit data, spacecraft maneuver parameters, and navigational operational parameters from the FDF. The EOC sends this information to the ASTER ICC for use in planning and scheduling the ASTER instrument. The EOC makes AM-1 orbit information available to the GSFC DAAC and ISTs to assist users and PIs/TLs in ASTER DAR generation. The SMC provides the EOC and ASTER ICC with management and operations directives, including the Long Term Science Plan (LTSP) and the Long-Term Instrument Plan (LTIP), which is based on the LTSP. The EOC uses the LTSP and LTIP to generate a long-term plan for the AM-1 spacecraft, which outlines anticipated subsystem operations and maintenance, as well as anticipated orbit maneuvers from the FDF.

This sequence verifies that the EOC uses the LTSP, LTIP, and long term spacecraft operations plan in generating Baseline Activity Profiles (BAP) for the non-complex instruments, whose activities are routine and repetitive. In contrast, the complex ASTER instrument is driven largely by non-routine, non-repetitive events such as DARs. The ASTER ICC generates and transmits to the EOC an activity list, which is based on data collection priorities defined in the ASTER LTIP, DARs, ASTER Science Team inputs, and instrument maintenance tasks.

This sequence confirms that the EOC generates, and sends to the NCC, a TDRSS schedule request, and that the NCC transmits the resulting TDRSS schedule to the EOC. This sequence verifies that the EOC integrates BAPs, ASTER activity list, spacecraft resource profile, special activities, and TDRSS schedule into a preliminary schedule for the target week of operations. The EOC sends the preliminary schedule to the non-complex instrument ISTs and the ASTER ICC.

To verify that conflicts introduced into the preliminary schedule are resolved, a situation is introduced whereby an instrument special activity results in a scheduling conflict. The EOC negotiates with the NCC, coordinates with the instrument IST, and generates a new TDRSS schedule request for the NCC. This sequence confirms that the EOC performs the necessary negotiating and coordinating to generate a conflict-free preliminary schedule, and provides this schedule to the ISTs and ASTER ICC.

This sequence confirms that the EOC generates a detailed activity schedule based on ASTER activity updates, BAP deviations for non-complex instruments, and other information. The EOC provides the detailed activity schedule to the GSFC DAAC, non-complex instrument ISTs, and ASTER ICC. Additionally, the EOC receives and saves information on requests for expedited data handling.

12.2.1. Test Case B120210.010-AM-1 Long-Term Planning

The AM-1 Long-Term Planning test case verifies that the ECS receives and distributes the LTSP, LTIPs, and AM-1 orbital and navigational parameters and prepares them for generating AM-1 instrument and spacecraft activities. The inputs to this test case include the LTSP and LTIPs received from the EOS Project Scientist at GSFC, orbit and navigational information received from the FDF, and AM-1 project database information containing both spacecraft and instrument parameters received from the AM-1 spacecraft vendor. The Demonstration method is used to verify this test case.

Prior to mission operations, the EOC receives, from the spacecraft vendor, AM-1 project database information containing both spacecraft and instrument parameters.

The SMC periodically receives the LTSP and LTIPs from the EOS Project Scientist to provide guidelines, policy, and priority for the AM-1 spacecraft and its ASTER, CERES, MISR, MODIS, and MOPITT instruments. The SMC provides the LTSP and LTIP to the EOC and ASTER ICC.

The EOC receives AM-1 predicted orbital data and ground track, navigational operational parameters, predicted site acquisition tables, user antenna views, and spacecraft maneuver parameters from the FDF. The EOC provides the ASTER ICC with planning aids, including predicted ephemeris and TDRSS view periods for the AM-1 spacecraft, to assist in the generation of planning and scheduling requests. Additionally, the EOC makes AM-1 spacecraft and orbit information available to the GSFC DAAC and ISTs to assist users and PIs (principal investigators)/TLs (team leaders) in ASTER DAR generation.

The EOC utilizes the LTSP, LTIPs spacecraft maneuvers, and other AM-1 activities in generating a long-term plan for the AM-1 spacecraft. This plan outlines anticipated EOC subsystem operations and maintenance and forecasted orbit maneuvers.

The EOC stores and maintains Investigator Working Group science guidelines specified in the LTSP and LTIPs, the long-term plan for the AM-1 spacecraft, and planning and scheduling information received from the FDF.

The expected results are that the SMC receives and distributes the LTSP and LTIPs, and that the EOC receives these LTSP and LTIPs as well as AM-1 project database information. Additional expected results are that the EOC receives and distributes orbital and navigational data and maneuver information; utilizes these inputs in generating a long-term plan for the AM-1 spacecraft; and stores AM-1 long-term planning information.

12.2.1.2 Test Case B120210.020-AM-1 Preliminary Scheduling

The AM-1 Preliminary Scheduling test case verifies that the EOC utilizes baseline activity profiles (BAPs), ASTER activity lists, and AM-1 spacecraft profiles to generate a preliminary schedule. The inputs to this test case include the LTSP, LTIPs, long-term plan for the AM-1 spacecraft, and AM-1 project database spacecraft parameters identified in the AM-1 Long-Term Planning test case (Section 12.2.1.1); and activity lists and pre-planned groups from the ASTER ICC. The Demonstration method is used to verify this test case.

The EOC generates baseline activity profiles (BAPs) for the CERES, MISR, MODIS, and MOPITT (non-complex) instruments. Each BAP contains a schedule of routine and repetitive activities for its associated instrument. The EOC uses the following inputs to generate the BAPs: the LTSP, LTIPs for the non-complex instruments, and long-term plan for the AM-1 spacecraft.

The complex ASTER instrument, in contrast to the other four AM-1 instruments, is driven largely by non-routine, non-repetitive events such as DARs. Accordingly, there is no BAP for the ASTER instrument, since a baseline set of ASTER activities is difficult to establish. Instead, the ASTER ICC generates, and transmits to the EOC, an activity list for the target period of operations. The ASTER activity list is based on data collection priorities defined in the ASTER LTIP, DARs, ASTER Science Team inputs, and instrument maintenance tasks.

The EOC uses the long-term plan for the AM-1 spacecraft, as well as spacecraft orbit maintenance needs, navigation needs, and subsystem maintenance needs to generate a spacecraft profile for the target period of operations.

The EOC uses the BAPs, ASTER activity list, and spacecraft profile to generate a TDRSS schedule request., which the EOC sends to the NCC. The NCC notifies the EOC that the request is accepted and transmits the TDRSS schedule to the EOC.

The EOC integrates the BAPs, the ASTER activity list, the spacecraft profile, the TDRSS schedule, and spacecraft parameters into a preliminary schedule for the target period of operations. The preliminary schedule represents an initial integrated schedule and includes activity identifiers, resource availability and usage requirements, time constraints and alternatives for planned activities, and TDRSS contact times. The EOC provides the preliminary schedule to the non-complex instrument ISTs and the ASTER ICC.

The ASTER ICC sends pre-planned groups to the EOC separately from the preliminary scheduling process. These groups contain mnemonics or groups of mnemonics defined by the ASTER instrument team for use during pre-defined contingency situations. Since the pre-planned groups are uplinked on an ad hoc basis, they are not included in the preliminary schedule.

The EOC stores and maintains the BAPs for the CERES, MISR, MODIS, and MOPITT instruments, the ASTER activity list and pre-planned command groups, the AM-1 spacecraft profile, and the preliminary schedule.

The expected results are that the EOC receives an ASTER activity list from the ASTER ICC; generates BAPs, an AM-1 spacecraft profile, and a TDRSS schedule request; receives a TDRSS schedule from the NCC; integrates all these items into a preliminary schedule for the target period of operations; distributes this preliminary schedule; receives preplanned command groups from the ASTER ICC; and stores AM-1 preliminary scheduling information.

12.2.1.3 Test Case B120210.030-AM-1 Scheduling Conflict

The AM-1 Scheduling Conflict test case verifies that the EOC works with the NCC to resolve scheduling conflicts and incorporates special instrument activities into the preliminary schedule. The inputs to this test case include the BAPs, and ASTER activity list, and AM-1 spacecraft

profile identified in the AM-1 Preliminary Scheduling test case (Section 12.2.1.2) and an instrument deviation from the MODIS IST. The Demonstration method is used to verify this test case.

The MODIS IST plans a special MODIS calibration activity that is not included in the MODIS BAP. To verify that the MODIS IST is allowed to submit activities for only the MODIS instrument, the MODIS IST submits calibration activity information for the CERES instrument. This request is rejected.

Then the MODIS IST provides the EOC with information about the MODIS calibration activity, which is a deviation from the MODIS BAP. The EOC accepts the deviation, notifies the IST, and combines it with the MODIS BAP to build a MODIS activity list. This MODIS activity list is integrated with the CERES, MISR, and MOPITT BAPs, the ASTER activity list, and the spacecraft profile to generate a TDRSS schedule request., which the EOC sends to the NCC. The NCC, however, notifies the EOC that the MODIS calibration activity request is rejected due to limited Space Network (SN) resources. The Scheduler on the EOC Flight Operations Team (FOT) negotiates with the NCC for additional SN resources. The result, however, is that no additional SN resources are available.

The EOC notifies, and coordinates with, the MODIS IST on the resource conflict. The MODIS IST revises the calibration activity and provides the resulting deviation to the EOC. The EOC then incorporates this deviation into a new TDRSS schedule request that includes the new MODIS deviation. The EOC sends this new request to the NCC. This time, the request is accepted, and the NCC sends the new TDRSS schedule to the EOC.

Within two hours of receiving the TDRSS schedule, the EOC integrates the activities of all instruments into a conflict-free preliminary schedule for the target period of operations. The EOC provides the ISTs and ASTER ICC with this preliminary schedule, which includes activity identifiers, resource availability and usage requirements, time constraints and alternatives for planned activities, and TDRSS contact times.

The expected results are that the EOC receives MODIS deviations from the MODIS IST; includes these deviations in TDRSS schedule requests; coordinates with the NCC in resolving scheduling conflicts; notifies the MODIS IST of the lack of SN resources; receives a TDRSS schedule from the NCC; generates a timely, conflict-free preliminary schedule; and distributes this preliminary schedule.

12.2.1.4 Test Case B120210.040-AM-1 Final Scheduling

The AM-1 Final Scheduling test case verifies that the EOC utilizes instrument activity lists to generate a detailed activity schedule. The inputs to this test case include the instrument activity lists received from the ISTs and the ASTER ICC. The Demonstration method is used to verify this test case.

The ISTs for the non-complex instruments provide the EOC with instrument activity lists, which the ISTs generate from the preliminary schedule generated in the AM-1 Scheduling Conflict test case (Section 12.2.1.3). The CERES IST specifies expedited data handling information for a specified time period of observation. This information is provided to the EOC so that an

investigator at the CERES SCF can quickly receive Level 0 expedited data within three hours of the end of the requested acquisition. The EOC flags the applicable CERES activity as requiring expedited data handling so that the observed CERES data will receive priority processing by EDOS once EDOS receives these data.

The ASTER ICC sends an ASTER instrument activity list to the EOC. Within two hours of receiving the last instrument activity list, the EOC integrates the activities of all instruments into a detailed activity schedule that covers several days. This detailed activity schedule includes instrument and spacecraft activities and spacecraft resource requirements for each activity. The EOC stores and maintains the detailed activity schedule and sends it to the GSFC DAAC, ISTs, and ASTER ICC.

The expected results are that the EOC receives instrument activity lists received from the ISTs and ASTER ICC; receives and flags CERES expedited data handling information; generates a timely detailed activity schedule based on these instrument activity lists; and stores and distributes the detailed activity schedule.

12.2.2 AM-1 Commanding Sequence

The AM-1 Commanding Sequence verifies that the EOC receives instrument command inputs, receives spacecraft and instrument software updates, generates spacecraft and instrument commands, and integrates, validates, and transmits spacecraft and instrument commands to EDOS for uplink to the AM-1 spacecraft.

The approved detailed activity schedule forms the basis of generating the command load for the AM-1 spacecraft and its instruments. The command load consists of spacecraft and instrument commands, tables, and software updates. This sequence verifies that the EOC has the capability to receive command inputs and software updates, generate commands and tables, and integrate and validate these commands, tables, and software updates into a command load for uplink to the spacecraft.

The EOC receives input on Spacecraft Control Computer (SCC)-stored instrument commands and tables, instrument microprocessor-stored tables and commands, and instrument software updates from ISTs and the ASTER ICC. The EOC validates these inputs, including an authorization check, command criticality checks, and schedule consistency. The EOC modifies the IST inputs if necessary, and generates additional instrument commands and tables if needed. The EOC also generates SCC-stored spacecraft commands and tables. Additionally, the EOC incorporates, into the overall command load, spacecraft software updates received from the SDVF. The EOC generates a ground script, which consists of time-stamped directives used by the EOC for uplinking the command load, dumping the spacecraft recorder, and processing real-time telemetry data.

The EOC validates all commands and tables and transforms them into CCSDS packets ready for use by the spacecraft and instruments. This sequence confirms that the EOC generates absolute time command (ATC) loads as well as real-time command loads. The ATC loads are ready for uplink nominally on the day prior to execution, based on the ground script. In contrast, real-time command loads executed immediately.

This sequence confirms that the EOC transmits both ATC loads and real-time command loads to EDOS via EBnet for uplink to the AM-1 spacecraft. The EOC also sends expedited data handling information to EDOS.

This sequence utilizes the capabilities of the TDRSS (nominal situation) as well as the GN, DSN, or WOTS (backup situation) for transmitting command loads. The TDRSS includes the Tracking and Data Relay Satellite (TDRS) ground terminals and TDRS. To verify the utilization of the backup systems in the event the TDRSS is inoperable, the EOC interfaces with the NCC to schedule ground station contacts with the DSN, GN, or WOTS. The NCC sends the resulting ground station schedule to the EOC.

12.2.2.1 Test Case B120220.010-AM-1 Command Load Generation

The AM-1 Command Load Generation test case verifies that the EOC receives and validates instrument command inputs and instrument and spacecraft software updates, generates spacecraft commands and tables, generates absolute time command (ATC) loads, and prepares a ground script for the target day. The inputs to this test case include instrument commands and tables, and software updates received from non-complex instrument ISTs and the ASTER ICC; an instrument software update received from the MODIS IST; a spacecraft software update received from the SDVF, and the detailed activity schedule generated in the AM-1 Final Scheduling test case (Section 12.2.1.4). The Test method is used to verify this test case.

The ASTER ICC and CERES IST use the detailed activity schedule to generate SCC-stored instrument commands and tables for their respective instruments for the target day. The ASTER ICC and CERES IST provide these commands and tables to the EOC. The EOC acknowledges receipt of ASTER commands and tables to the ASTER ICC.

The MISR, MODIS, and MOPITT ISTs also use the detailed activity schedule to generate instrument microprocessor-stored commands and tables for their respective instruments. The ISTs provide these commands and tables to the EOC.

The EOC validates all commands and tables and transforms them into a form ready for use by the spacecraft and instruments. Validation includes an authorization check, command criticality checks, and schedule consistency. The EOC modifies the IST and ASTER ICC inputs, if necessary, and generates additional instrument commands and tables if needed. At least once per day, the EOC generates, within one hour, SCC-stored spacecraft commands and tables for the target day, based on the detailed activity schedule.

To verify the integration of instrument software updates into the command load, the MODIS IST provides the EOC with a MODIS instrument software update. To verify AM-1 spacecraft software update integration, the SDVF sends an spacecraft software update to the EOC.

Within a 1-hour period, the EOC builds an ATC load, which contains commands for the target 24-hour period. The ATC load includes SCC-stored instrument commands and tables, instrument microprocessor-stored commands and tables, the MODIS instrument software update, and the spacecraft software update. As part of building this ATC load, the EOC accomplishes the following tasks: ensures that the spacecraft's limit on the number of commands to be issued at the same absolute time has not been exceeded, validates all uplink data to ensure there are no

violations of spacecraft constraints, manages spacecraft computer stored command memory, and packages commands for onboard storage.

The EOC generates a ground script, which consists of time-stamped directives used by the EOC for the target day. This ground script includes such ground activities as uplinking the ATC load, and dumping the spacecraft recorder.

The expected results are that the EOC validates SCC-stored commands and tables received from the ASTER ICC and CERES IST; validates instrument microprocessor-stored commands and tables received from the MISR, MODIS, and MOPITT ISTs; receives spacecraft and MODIS instrument software updates; generates spacecraft commands and tables; builds a validated ATC load; generates a "best estimate" of SCC and instrument microprocessor memories; and prepares a ground script for the target day.

12.2.2.2 Test Case B120220.020-ATC Load Uplink

The ATC Load Uplink test case verifies that the EOC transmits the ATC load for the target day to EDOS and receives spacecraft uplink status from EDOS. This test case assumes that the TDRS and the TDRS ground terminal are operational. The inputs to this test case include the ATC load and ground script generated in the AM-1 Command Load Generation test case (Section 12.2.2.1) and CERES expedited data handling information identified in the AM-1 Final Scheduling test case (Section 12.2.1.4). The Test method is used to verify this test case.

On the day preceding the target day, and at the time specified in the ground script, the EOC transmits the ATC load and CERES expedited data handling information to EDOS via EBnet (EOSDIS Backbone Network). EDOS provides the EOC with command transmission status information. The EOC evaluates this status information, determines that a successful command transmission resulted, and logs the results. EDOS transmits the ATC load to the operational TDRSS ground terminal for uplink to the TDRS and the AM-1 spacecraft.

The simulated AM-1 spacecraft receives the ATC load and sends a command uplink acknowledgment to the EOC using the TDRS, TDRS ground terminal, and EDOS. The EOC generates log information indicating the successful ATC load uplink. The EOC notifies the ISTs and ASTER ICC of successful uplink.

The expected results are that the EOC transmits the ATC load to the AM-1 spacecraft via EDOS, the TDRS ground terminal, and the TDRS; generates log information indicating the status of uplink; and notifies the ISTs and ASTER ICC of uplink status.

12.2.2.3 Test Case B120220.030-AM-1 Real-Time Contingency Commanding

The AM-1 Real-Time Contingency Commanding test case verifies that the EOC builds and validates real-time commands, retrieves ASTER pre-planned command groups, coordinates with the NCC and EDOS for backup communications resources and real-time commanding needs, and utilizes the DSN/GN/WOTS backup system. The inputs to this test case include a simulated fix to an unsafe condition on the AM-1 spacecraft and ASTER pre-planned groups stored in the AM-1 Preliminary Scheduling test case (Section 12.2.1.2). The Test method is used to verify this test case.

The NCC notifies the EOC that the SN will be inoperable for at least six hours due to an unforeseen emergency. The EOC notifies the ISTs and ASTER ICC of this situation.

Several minutes after the SN outage is received by the EOC, however, a simulated solution to an unsafe AM-1 spacecraft condition is found. This fix must be implemented as soon as possible. The EOC proceeds to build a real-time command group containing the fix to the spacecraft unsafe condition.

In addition to the AM-1 spacecraft problem, an ASTER instrument contingency necessitates the uplink of a pre-planned command group at the next opportunity. The FOT notifies the ASTER ICC and retrieves the appropriate stored ASTER pre-planned command group.

The EOC notifies the NCC and EDOS of the critical need to uplink a real-time command load to fix the spacecraft unsafe condition and the ASTER instrument contingency. Since the SN is inoperable, the NCC and EOC coordinate with each other and with the DSN, GN, and WOTS to provide backup support. The necessary communications resources to accommodate real-time commanding are available from WOTS. The NCC provides the EOC with the WOTS schedule. The EOC, in turn, provides the ISTs and ASTER ICC with this information.

The EOC validates both the real-time command group for fixing the spacecraft and the pre-planned command group for the ASTER instrument. The EOC merges both sets of commands into one uplink stream and transmits the real-time command load to EDOS via EBnet. EDOS provides the EOC with command transmission status information. The EOC evaluates this status information, determines that a successful command transmission resulted, and logs the results. EDOS transmits the real-time command load to WOTS for uplink to the AM-1 spacecraft.

The simulated AM-1 spacecraft receives the real-time command load from WOTS, and the commands are executed immediately. The spacecraft transmits an acknowledgement of successful uplink to WOTS, which passes it to EDOS. EDOS, in turn, uses EBnet to send the acknowledgement to the EOC. The EOC verifies that the real-time command load has been successfully uplinked. The EOC notifies the ASTER ICC of successful uplink and makes appropriate EOC history log entries.

The expected results are that the EOC validates real-time commands received from the ASTER ICC; builds and validates its own real-time commands; coordinates with the NCC and EDOS for backup communications resources; utilizes the WOTS for transmitting real-time commands; keeps the ASTER ICC informed of real-time commanding status; and makes appropriate log entries.

12.2.3 Telemetry, Analysis, and Verification Sequence

The Telemetry, Analysis, and Verification Sequence verifies that the EOC processes and analyzes real-time and spacecraft recorded telemetry received from EDOS. The EOC capabilities to utilize the TDRSS (nominal situation) and DSN, GN, or WOTS (backup situation) for receiving downlink data through EDOS are verified.

This sequence confirms the EOC capabilities to receive and process real-time telemetry from EDOS via EBnet and verify that a real-time command load has been executed. The EOC

decommutates the telemetry, performs conversions and calibrations, determines values for other derived parameters, and performs limits checking. The EOC updates the spacecraft and ASTER instrument configuration and status of subsystems, and notifies the ISTs and ASTER ICC of the status of command execution and spacecraft status. Additionally, the EOC provides the FDF with orbital and attitude data.

This sequence verifies that the EOC receives and processes spacecraft recorder telemetry for the spacecraft and instruments. The EOC provides the FOT with telemetry and analysis displays on the health and safety of the AM-1 spacecraft, its subsystems, and instruments. This sequence confirms that the EOC provides various displays for FOT analysis, including graphs of parameter statistics and values over time. The EOC capabilities to determine best estimates of SCC and instrument memory contents and to compare master ground images with the corresponding memory dumps are verified.

This sequence confirms that the EOC receives ASTER instrument status information from the ASTER ICC. The EOC provides the ASTER ICC and ISTs with spacecraft status. The capability for the EOC to provide ISTs with instrument and/or spacecraft engineering data is verified.

This sequence confirms the capability of the ECS to support various verification activities for the ECS/AM-1 interface and the AM-1 mission. Specifically, the ECS supports end-to-end system testing, AM-1 operations testing and acceptance testing with FDF, NCC, EDOS, EBnet, ASTER ICC, and SDVF. Additionally, the ECS supports AM-1 pre-launch, satellite verification, instrument verification, and operational phases.

12.2.3.1 Test Case B120230.010-AM-1 Real-Time Telemetry Processing

The AM-1 Real-Time Telemetry Processing test case verifies that the EOC supports the DSN/GN/WOTS for receiving AM-1 engineering and housekeeping data, processes and verifies the real-time telemetry received, displays telemetry parameters, notifies the ISTs and ASTER ICC of spacecraft status based on telemetry evaluation, and provides the FDF with a subset of the telemetry data. The inputs to this test case include the EOC Project Database containing telemetry parameter limit values and real-time telemetry generated as a result of the real-time command load uplinked in the AM-1 Real-Time Commanding test case (Section 12.2.2.3). The Test method is used to verify this test case.

The simulated AM-1 spacecraft generates telemetry as a result of the real-time command load that included a fix to a spacecraft unsafe condition and an ASTER instrument contingency identified in the AM-1 Real-Time Commanding test case (Section 12.2.2.3). The spacecraft transmits the real-time telemetry to WOTS. WOTS, in turn, passes the telemetry to EDOS. EDOS uses EBnet to send the telemetry to the EOC. EDOS also transmits telemetry to the ASTER ICC.

The EOC receives the spacecraft and instrument telemetry in the form of Consultative Committee for Space Data Systems (CCSDS) packets. The EOC decommutates the contents of the packets, performs conversions and calibrations, and determines values for other derived parameters. Limit checking is performed on parameters, and those that have limit violations, if

any, are flagged. The actual parameter values and associated limit values are available for display. A member of the FOT requests and receives this information via automated displays.

The EOC verifies that the real-time command load has been executed properly by examining the command verification status in the housekeeping telemetry. The EOC updates the spacecraft and ASTER instrument configuration and status of subsystems, based on the execution of the command load. After analyzing the telemetry, the EOC notifies the ISTs and ASTER ICC of successful execution of the real-time time command load and provides them with current spacecraft status.

The EOC extracts a subset of the telemetry for transfer to the FDF. This subset includes attitude sensor data, navigation telemetry data, and spacecraft maneuver telemetry data.

The MODIS IST requests real-time instrument housekeeping and engineering data, real-time spacecraft housekeeping data, and derived parameters for the MODIS instrument. The EOC provides the MODIS IST with the data requested. The IST requests a display of instrument engineering data, and the display is provided.

The ASTER ICC evaluates the telemetry for the ASTER instrument and provides the EOC with ASTER instrument status information.

The EOC makes appropriate EOC history log entries for applicable events including the receipt of telemetry from EDOS, spacecraft status and notification provided to the ISTs and ASTER ICC, transfer of selected telemetry data to the FDF, and receipt of ASTER instrument status from the ASTER ICC.

The expected results are that the EOC receives real-time telemetry from EDOS and WOTS; verifies that the real-time command load has been executed; decommutates, validates, and displays real-time telemetry; notifies the ISTs and ASTER ICC of AM-1 spacecraft status; provides orbit, attitude, and maneuver data to the FDF; receives ASTER instrument status from the ASTER ICC; and makes appropriate log entries.

12.2.3.2 Test Case B120230.020-AM-1 Spacecraft Recorder Telemetry Processing and Analysis

The AM-1 Spacecraft Recorder Telemetry Processing and Analysis test case verifies that the EOC processes and verifies telemetry data received from the AM-1 spacecraft recorder, displays and analyzes telemetry parameters, and notifies the ISTs and ASTER ICC of spacecraft status based on telemetry analysis. The inputs to this test case include the EOC Project Database containing telemetry parameter limit values, the ground script generated in the AM-1 Command Load Generation test case (Section 12.2.2.1), and the spacecraft recorder housekeeping telemetry generated as a result of the ATC load uplinked in the ATC Load Uplink test case (Section 12.2.2.2). The Test method is used to verify this test case.

At the time specified in the ground script, the EOC receives the housekeeping telemetry from the AM-1 spacecraft recorder. The telemetry includes housekeeping data for the spacecraft and the five AM-1 instruments: ASTER, CERES, MISR, MODIS, and MOPITT. The simulated AM-1 spacecraft retrieves the housekeeping telemetry from its spacecraft recorder and transmits it to

the TDRS, which transmits the telemetry to the TDRS ground terminal. The ground terminal provides the telemetry to EDOS, which transmits it to the ECS via EBnet. EDOS also transmits telemetry to the ASTER ICC.

The EOC receives the spacecraft and instrument telemetry in the form of CCSDS packets. The EOC decommutates the contents of the packets, performs conversions and calibrations, and determines values for other derived parameters. The EOC analyzes the telemetry for the spacecraft and each of the five instruments. Limits checking and trend analysis are performed on parameters, and those that have limit violations are flagged.

The EOC provides the FOT with automated displays for performing further analysis and to assist in providing recommended courses of action. An FOT member requests a display of parameter minimum, maximum, and mean values, standard deviation, and time and duration of limit violations, if any, contained in the telemetry for the spacecraft electrical power subsystem and the MODIS instrument. The FOT member requests the display of two parameters over time for comparison purposes.

The EOC determines the "best estimate" of both SCC memory contents and MISR, MODIS, and MOPITT instrument memory contents and maintains associated master ground images of SCC and instrument memory. The EOC compares these master ground images with the corresponding SCC and instrument memory dumps.

After analyzing the telemetry, the EOC notifies the ISTs and ASTER ICC of execution of the ATC load and provides them with spacecraft and instrument status. The MODIS IST requests real-time instrument housekeeping and engineering data and real-time spacecraft housekeeping data. The EOC provides the MODIS IST with the data requested.

The ASTER ICC evaluates the telemetry for the ASTER instrument and provides the EOC with ASTER instrument status information.

The EOC makes appropriate EOC history log entries for applicable events including the receipt of telemetry from EDOS, spacecraft status and notification provided to the ISTs and ASTER ICC, and receipt of ASTER instrument status from the ASTER ICC.

The expected results are that the EOC receives spacecraft recorder telemetry; decommutates, analyzes, and displays spacecraft recorder telemetry; determines "best estimates" of memory contents and compare memory dumps with the corresponding master ground images; notifies the ISTs and ASTER ICC of AM-1 spacecraft and instrument status; receives ASTER instrument status from the ASTER ICC; and makes appropriate log entries.

12.2.3.3 Test Case B120230.030-Support to AM-1 Verification Activities

The Support to AM-1 Verification Activities test case verifies that the ECS is capable of supporting various verification activities for the ECS/AM-1 interface and the AM-1 mission. The inputs to this test case include the results of all other test cases in the AM-1 End-to-End Scenario (Section 12.2). The Analysis method is used to verify this test case.

Early interface testing for the AM-1 mission is provided by ECS in Release A. Release B extends this testing capability and supports end-to-end system testing, AM-1 operations testing

and acceptance testing with FDF, NCC, EDOS, EBnet, ASTER ICC, and SDVF. Additionally, Release B supports AM-1 pre-launch, satellite verification, instrument verification, and operational phases.

The test cases in this scenario verify the EOC's interface to the SMC, GSFC DAAC, and ECS external entities including the FDF, NCC, EDOS, EBnet, ASTER ICC, and SDVF. To the extent that these test cases are executed and results obtained, the EOC, GSFC DAAC, and SMC are capable of being monitored during acceptance testing. Benchmark tests and test data sets are utilized in this scenario for system verification and data quality evaluation. Additionally, standard test data sets, as well as test functions of the spacecraft simulator(s) are used in validating EOC functions.

To the extent that the test cases in this scenario are verified, the ECS is prepared to support instrument integration activities associated with the AM-1 spacecraft prior to launch as well as spacecraft and instrument tests at the integration and launch sites.

To the extent that these test cases are verified, that sufficient hardware and personnel resources are available, and that the EOC is properly configured, the FOS is capable of supporting a test mode of operation that does not interfere with ongoing operations, and which supports independent element and subsystem tests, end-to-end tests, and integration and verification activities occurring during spacecraft and instrument integration and test, pre-launch, and upgrades and enhancements.

The expected result is that the ECS is capable of supporting early interface testing, operations testing, acceptance testing, and testing during the pre-launch, satellite verification, and instrument verification and operational phases for the AM-1 mission.

12.3 ASTER DAR End-to-End Scenario

The ASTER DAR End-to-End Scenario verifies ECS end-to-end capabilities in support of ASTER DARs. This scenario encompasses preparing, submitting, scheduling, ingesting, processing, archiving, distributing, accessing, and managing ASTER DARs and resulting science data.

This scenario is conducted primarily at the EDC DAAC and the EOC, although the GSFC, LaRC, and JPL DAACs and SMC are also involved. ECS external interfaces exercised include the ASTER GDS, NCC, EDOS, EBnet, NOAA ADC, and ASTER SCF.

This scenario verifies the following capabilities: processing user requests for ASTER DAR information; validating DAR requests and providing them to the ASTER GDS; integrating ASTER instrument activities associated with DARs into the AM-1 planning and scheduling process; ingesting, processing, archiving, distributing, and reprocessing ASTER data and products generated as a result of the DAR observation; and providing user access to these ASTER data and products.

Since DARs impact mission activities and result in the creation of "new" earth science data, many ECS capabilities are confirmed. This scenario also includes integrating DAR-related

ASTER instrument activities into the overall AM-1 mission schedule and command load, and incorporating DAR-related product generation into DAAC production schedules.

The scenario confirms that the ECS provides users with information about ASTER DAR generation; reviews DARs submitted by authorized users; interfaces with the ASTER ICC on DAR inputs, DAR status, and the impact of DARs on AM-1 overall mission planning and scheduling activities; negotiates with the NCC on TDRSS resources; transmits the command load containing the data acquisition commands to EDOS; provides users with DAR status; ingests and archives the ASTER science data resulting from DARs; ingests ancillary data and products; generates, archives, and distributes ASTER DAR science products; maintains information about DARs and resulting science data and products; and provides users with access to these products.

12.3.1 ASTER DAR Development Sequence

The ASTER DAR Development Sequence verifies that the ECS provides users with information on DARs for the ASTER instrument and guides them through the process of specifying DAR input parameters, products to be generated, and distribution requirements. The capability to provide users with DAR default settings and context and range-of-values information for instrument configurable parameters and to process user inputs for these parameters is confirmed.

This sequence verifies that the EOC provides the GSFC DAAC with AM-1 spacecraft constraints and orbit information needed for DAR planning. The capability of the ECS to provide users with quasi-static ASTER instrument constraints and information received from the ASTER ICC prior to AM-1 launch is confirmed.

The capability for the ECS to permit authorized users accessing the ASTER ICC and IST to submit DARs is confirmed. The ECS provides authorized users with displays and tools to aid in DAR formulation input and specification of DAR parameters. The ECS performs validation checks on the inputs. This sequence confirms that the ECS provides the capability for an authorized user to specify the generation and distribution of ASTER products as part of submitting ASTER DARs. The ECS capability to analyze the processing and distribution inputs for validity and notify the user accordingly is verified.

This sequence confirms that the ECS stores the DAR information to provide a means of tracking future DAR status, coordinate ancillary data needs for product generation, and ensure that information on the ECS-generated products is captured in the DAAC product generation schedules. Besides storing the DAR information internally, the ECS transforms the DAR information into the proper DAR format for transmission to the ASTER GDS. The ASTER GDS processes and analyzes the DAR and transmits a status message to the ECS and the user.

12.3.1.1 Test Case B120310.010-ASTER DAR Basic Information

The ASTER DAR Basic Information test case verifies that the ECS provides users with AM-1 spacecraft and ASTER instrument information so that users have the necessary information to formulate DARs. The inputs to this test case include ASTER instrument operations and

constraint information, AM-1 spacecraft information, and current data acquisition plans and schedules. The Demonstration method is used to verify this test case.

The EDC DAAC receives the ASTER instrument operations and constraint information sent by the ASTER GDS and stores this information in a database used for developing and submitting DARs (DAR Development Database). This information is quasi-static and includes descriptive information on the ASTER instrument, default settings for instrument configurable parameters, context and range-of-values information for instrument configurable parameters, and instrument constraint information.

The EOC sends the spacecraft information, including orbit information, as well as data acquisition plans and schedules to the GSFC DAAC. The GSFC DAAC stores this information for use in DAR development.

The expected results are that the GSFC DAAC ingests and stores ASTER instrument operations and constraint information, AM-1 spacecraft information, and data acquisition plans and schedules.

12.3.1.2 Test Case B120310.020-ASTER DAR User Interface

The ASTER DAR User Interface test case verifies that the ECS provides users with DAR information displays and the means to formulate DARs and specify DAR input parameters. The inputs to this test case include the DAR Development Database mentioned in the ASTER DAR Basic Information test case. To exercise user access privileges for submitting DARs, four types of users are initially employed in this test case: an authorized ASTER ICC user, an authorized ASTER IST user, an unauthorized user, and an authorized science researcher accessing the ECS at the EDC DAAC. After the initial check of DAR privileges, only the researcher accessing the ECS is utilized for the remainder of this test case as well as throughout the remainder of this sequence and scenario. The reason is that DAR processing and DAR-related data transfers, which follow DAR submittal authorization, are fundamentally the same regardless of the DAR initiator. The Demonstration method is used to verify this test case.

To confirm that the ASTER ICC is allowed to submit DARs, an authorized ASTER ICC user begins the process of DAR submittal. The ECS recognizes that the user is authorized and allows the user to proceed. However, since the user merely wants to confirm DAR submittal authorization, the user cancels further DAR processing. Similarly, an authorized ASTER IST user starts the DAR submittal process, is allowed to proceed, but cancels further processing.

To verify that only authorized users can submit DAR inputs, an unauthorized user accessing the ECS attempts to submit DAR information. The ECS compares the user's DAR privileges with the authorization list, detects an unauthorized user, and notifies the user that he/she cannot continue the DAR submittal process. The unauthorized user attempts further DAR processing anyway, but is rejected again. Finally an authorized user accessing the ECS (at the EDC DAAC, for example) requests information about submitting ASTER DAR input, is allowed to proceed, and continues with the DAR submittal process.

The authorized user begins the process of obtaining information about submitting DAR input for an acquisition four weeks into the future. The ECS retrieves information from the DAR

Development Database and displays the information to the user. The ECS provides the user with DAR-related climatological information; descriptive information on ASTER instruments and parameters available in standard products; geographic reference aids; spacecraft location projections; and orbital tracks. The user seeks and receives help from the ECS to confirm that the ASTER data acquisition is needed to generate the product desired.

Once the user has received the basic DAR-related information, the user decides to proceed with the process of formulating an ASTER DAR. The ECS retrieves default settings for instrument-configurable parameters from the DAR Development Database. The ECS then displays these and other required information to the user, who modifies or enters values as appropriate. During the course of specifying instrument-configurable parameters, the user requests, and the ECS provides, assistance with setting these parameters. Once the user reviews this help information, he/she modifies default settings, as necessary, and specifies the other information needed for DAR submittal. The DAR information includes: observation number, experimenter identification, experimenter address, investigation identification, scientific discipline, observation repetition period, tolerance in observation time, user priority, scheduling priority and target of opportunity flag, descriptive text, start/stop latitude/longitude, earliest start time, latest stop time, minimum coverage required, maximum coverage desired, number of instruments involved in the investigation, and identification of instruments involved in the investigation. The inputs submitted by the user include an invalid instrument setting and an invalid target area for the time of the ASTER observation.

The expected results are the rejection of DAR input from the unauthorized user and the acceptance of DAR input from the authorized ASTER ICC, ASTER IST, and science researcher users. Additional expected results are that the ECS displays information needed in planning and formulating ASTER DARs, displays the default settings contained in the DAR Development Database, provides assistance in setting parameters, and enables the authorized user to submit all required DAR input parameters.

12.3.1.3 Test Case B120310.030-ASTER DAR Basic Input Check

The ASTER DAR Basic Input Check test case verifies that the ECS performs range and reasonableness checks on DAR input. The inputs to this test case include the DAR parameters specified by the authorized user (hereafter called the DAR originator) in the ASTER DAR User Interface test case (Section 12.3.1.2). The Test method is used to verify this test case.

The ECS receives DAR input parameters from the DAR originator and performs high-level range-of-value and reasonableness checks. The DAR Development Database contains ASTER constraints and the valid range of values for instrument configurable parameters. The ECS compares the DAR originator's inputs against these constraints and parameters.

In the ASTER DAR User Interface test case (Section 12.3.1.2), the DAR originator specified an invalid instrument setting as well as an invalid target area for the time of the ASTER observation. The ECS notifies the DAR originator of each error and allows him/her to re-enter the information. The DAR originator then enters another value for the instrument setting and inputs another target area. The ECS checks these inputs. This time, the instrument setting is within the range of acceptable values, but the target area specified is invalid once again. The

ECS notifies the DAR originator of the error and provides him/her with another opportunity to enter a valid target area. This time the DAR originator enters a valid target area, and the DAR inputs are stored for further processing.

The expected results are that the ECS validates DAR inputs, notifies the DAR originator upon detection of invalid input, provides the DAR originator with an opportunity to resubmit parameters, validates the resubmitted inputs, and stores the DAR originator's inputs.

12.3.1.4 Test Case B120310.040-ASTER DAR Product and Distribution Specification

The ASTER DAR Product and Distribution Specification test case verifies that the ECS provides a user with the means of specifying product order information and captures this information for product planning and distribution purposes. The inputs to this test case include DAR information validated in the ASTER DAR Basic Input Check test case (Section 12.3.1.3) as well as tools/displays needed to specify ASTER products and distribution. The Demonstration method is used to verify this test case.

The ECS provides the DAR originator with the means of specifying products to be generated as a result of the ASTER DAR observation and the distribution of these products. The DAR originator specifies the generation of two types of ASTER products: a standard Level 2 product generated by the EDC DAAC, i.e., AST09: Surface Radiance, and a special product generated by the ASTER GDS. The DAR originator utilizes available information to specify attributes for generating the special ASTER GDS product. The DAR originator places a subscription with the ECS requesting notification when the AST09 product has been generated and archived. This subscription also includes notification upon AST09 reprocessing.

The DAR originator also specifies distribution parameters for both the AST09 and ASTER GDS products. Distribution of the AST09 product is specified via subscription. These parameters include distribution of both products to the DAR originator, via physical media (4-mm tape), and to the ASTER Science Team (AST) at the JPL DAAC, via communications network. Distribution parameters include the DAR originator's mailing address and e-mail address.

The ECS validates the DAR originator's product and distribution inputs, generates a production request for the AST09 product, and stores this information for use in production planning, product generation, and product distribution. The ECS provides the SMC with a record of the DAR order, which is entered into the data order history database.

The expected results are that the ECS displays information for specifying ASTER DAR products and distribution and validates and stores product and distribution inputs.

12.3.1.5 Test Case B120310.050-ASTER DAR Transfer to ASTER GDS

The ASTER DAR Transfer to ASTER GDS test case verifies that the ECS transforms the DAR input and transmits the reformatted DAR to the ASTER GDS. Inputs to this test case include the DAR information validated by the ECS in the ASTER DAR Basic Input Check test case (Section 12.3.1.3) and in the ASTER DAR Product and Distribution Specification test case (Section 12.3.1.4). The Demonstration method is used to verify this test case.

The ECS takes the validated DAR information and transmits it to the ASTER GDS in the format specified in the ECS-ASTER IRD and ICD. The reformatted DAR is sent 23 days prior to the start of the target week containing the ASTER observation time period. The DAR contains the following information: observation number, experimenter identification, experimenter address, investigation identification, scientific discipline, observation repetition period, tolerance in observation time, user priority, scheduling priority and target of opportunity flag, descriptive text, start/stop latitude/longitude, earliest start time, latest stop time, minimum coverage required, maximum coverage desired, and number and identification of instruments involved in the investigation. The DAR also includes an associated product generation request and a product distribution request.

The expected results are that the ECS reformats DAR information into the ECS-ASTER ICD format and sends the reformatted DAR to the ASTER GDS.

12.3.1.6 Test Case B120310.060-ASTER DAR Analysis

The ASTER DAR Analysis test case verifies that the ECS transmits to the DAR originator DAR notification messages and status messages received from the ASTER GDS. Inputs to this test case include the reformatted ASTER DAR sent by the ECS in the ASTER DAR Transfer to ASTER GDS test case (Section 12.3.1.5). The Demonstration method is used to verify this test case.

The ASTER GDS processes and analyzes the DAR. The ASTER ICC, under the guidance of the AST, which utilizes the ASTER IST, accepts or rejects the DAR based on approved guidelines and priorities. In determining the fate of the DAR, the ASTER GDS evaluates the completeness and consistency of the DAR, instrument capabilities and constraints, priorities based on the LTSP, LTIP requirements and constraints, and availability of resources. In this test case, the AST determines that a DAR parameter requires modification, but does not reject the DAR. Instead, the AST consults with the DAR originator, a resolution is reached, and the AST modifies the DAR, which is accepted and stored within the ASTER GDS. The DAR includes primary requests with prioritized alternatives. The DAR also requires coordination with other observations. The ASTER ICC assigns a priority to the DAR, based on a conformity check against the LTSP and LTIP. The ASTER GDS notifies the ECS and DAR originator of DAR status.

The expected result is that the ECS stores DAR status and related information received from the ASTER GDS.

12.3.2 ASTER DAR Flight Operations Sequence

The ASTER DAR Flight Operations Sequence confirms that the ECS accomplishes all activities required to schedule the ASTER DAR observation. Additionally, the capability to integrate all DAR-related commands into an ATC load and transmit the load to EDOS is verified.

This sequence confirms that the EOC receives from the ASTER ICC an activity list that includes DAR-related activities and resources. The EOC includes information from the activity list to generate a TDRSS schedule request, which the EOC sends to the NCC. The capability of the

EOC to notify the ASTER ICC of scheduling conflicts associated with the ASTER instrument and to receive instrument deviations from the ASTER ICC is verified. The EOC integrates these deviations into another TDRSS schedule request and sends it to the NCC, which generates a conflict-free TDRSS schedule. This sequence confirms that the EOC generates a preliminary schedule that includes ASTER DAR resources and transmits it to the ASTER ICC.

The ASTER ICC utilizes the preliminary schedule to generate an ASTER instrument activity list and sends it to the EOC. This sequence verifies that the EOC has the capabilities to detect scheduling conflicts when integrating ASTER activities into a detailed activity schedule, to notify the ASTER ICC of these conflicts, to confer with the ASTER ICC on conflict resolution, to perform "what if" analysis, and to provide the ASTER ICC with results of the "what if" analysis. The ASTER ICC generates and submits to the EOC instrument deviations. This sequence confirms that the EOC integrates the ASTER activities, including the instrument deviations into a conflict-free detailed activity schedule and sends this schedule to the ASTER ICC.

After the detailed activity schedule is generated, the DAR originator queries the ECS on DAR status. This sequence confirms that the ECS forwards the status request to the ASTER GDS, and that the ECS notifies the DAR originator of the status received from the ASTER GDS.

This sequence verifies that the instrument activity list and deviations are used by the EOC for generating the AM-1 integrated command load, which contains the information needed by the ASTER instrument to make the data acquisition specified by the DAR. The sequence also confirms that the EOC notifies the ASTER ICC of the command load generation status.

The capability of the EOC to transmit the command load to EDOS for transfer to the AM-1 spacecraft via the TDRSS is confirmed. The EOC verifies receipt of the command load by the AM-1 spacecraft. This sequence confirms that the EOC provides the ASTER ICC with uplink status information.

12.3.2.1 Test Case B120320.010-ASTER DAR Preliminary Scheduling

The ASTER DAR Preliminary Scheduling test case verifies that the EOC accomplishes the activities necessary to incorporate ASTER DAR resources into a preliminary schedule. Inputs to this test case include the DAR approved in the ASTER DAR Analysis test case (Section 12.3.1.6). The Test method is used to verify this test case.

The ASTER GDS maintains information on the approved DAR, converts the DAR into scheduling directives suitable for inclusion in ASTER plans and schedules, and adds the targets associated with the DAR to the approved acquisition target list. The ASTER GDS develops an activity list for the target week that includes the DAR observation. The activity list includes DAR information as well as data collection activities defined in the LTIP, AST inputs, and instrument maintenance tasks. The activity list is sent to the EOC. The EOC uses the activity list, the BAPs from the four non-complex instruments, and the spacecraft profile to generate a TDRSS schedule request. The EOC sends this request to the NCC.

In this test case, the NCC notifies the EOC that the resource demands imposed by the ASTER DAR cause a scheduling conflict with the TDRSS. The EOC notifies the ASTER ICC of the

problem. The EOC negotiates with the NCC for additional SN resources, but the result is that the resource needs of the ASTER instrument must be modified. Consequently, the ASTER ICC generates an instrument deviation and sends it to the EOC. The EOC integrates this deviation with the ASTER activity list and sends them with the BAPs and spacecraft profile to the NCC. The result this time is a conflict-free TDRSS schedule, which the NCC provides to the EOC. The EOC then generates a preliminary schedule that includes DAR identifiers, resource availability and usage requirements, time constraints, and TDRSS schedule for the target week of operations. The EOC transmits the preliminary schedule to the ASTER ICC.

The expected results are that the EOC receives the activity list and instrument deviations from the ASTER ICC; integrates them into TDRSS schedule requests; notifies the ASTER ICC of scheduling conflicts; generates a preliminary schedule that includes ASTER DAR resources; and sends this schedule to the ASTER ICC.

12.3.2.2 Test Case B120320.020-ASTER DAR Final Scheduling

The ASTER DAR Final Scheduling test case verifies that the EOC accomplishes the activities necessary to incorporate ASTER DAR activities into a detailed activity schedule. Inputs to this test case include the preliminary schedule generated in the ASTER DAR Preliminary Scheduling test case (Section 12.3.2.1). The Test method is used to verify this test case.

The ASTER ICC utilizes the preliminary schedule to generate an ASTER instrument activity list for each day of the target week, including the day of the ASTER DAR observation. This activity list is sent to the EOC. The EOC integrates the ASTER activities, including those associated with the DAR, and the other AM-1 instrument activities into a detailed activity schedule. In this test case, however, a scheduling conflict results due to ASTER activities. The EOC notifies the ASTER ICC of the conflict and the cause. The EOC and ASTER ICC confer, and the ASTER ICC submits a "what if" instrument activity list to the EOC to analyze the impact of alternative ASTER instrument activities on the integrated schedule. The EOC performs the "what if" analysis without actually affecting the operational detailed activity schedule and sends the "what if" results to the ASTER ICC. These results indicate that the EOC could successfully integrate the "what if" ASTER instrument activities into the schedule and still accomplish the DAR observation. The ASTER ICC then generates and submits to the EOC an instrument deviations, which includes instrument activity changes based on the "what if" list. The EOC integrates the ASTER activities, including the instrument deviations, with the activities of the other instruments into a conflict-free detailed activity schedule, which is sent to the ASTER ICC. This schedule includes ASTER activities and traceability of ASTER activities to DARs as well as spacecraft activities and resources.

The DAR originator requests the current DAR status. The ECS transmits a DAR status request to the ASTER GDS, which responds with a DAR status message containing date and time, instrument identifier, DAR identifier, request status, and implementation schedule. The ECS stores the DAR status and related information and relays them to the DAR originator.

The expected results are the EOC capabilities to receive the instrument activity list and instrument deviations from the ASTER ICC, notify the ASTER ICC of scheduling conflicts, perform schedule impact analysis on "what-if" activity lists received from the ASTER ICC, send

"what-if" results to the ASTER ICC, generate and send to the ASTER ICC a detailed activity schedule containing DAR-related activities, and process DAR status requests and related information.

12.3.2.3 Test Case B120320.030-ASTER DAR Command Load

The ASTER DAR Command Load test case verifies that the EOC integrates ASTER DAR commands into an ATC command load and transmits the command load to EDOS. The focus is on confirming EOC DAR-related activities that occur prior to command execution. The inputs to this test case include the ASTER instrument activity list and deviations generated by the ASTER ICC in the ASTER DAR Final Scheduling test case (Section 12.3.2.2). The Test method is used to verify this test case.

The ASTER instrument activity list and associated deviations are used by the EOC to generate the AM-1 integrated command load. This test case verifies that the command load contains the information needed to accomplish the DAR observation. The test case also confirms that the EOC sends the command load generation status to the ASTER ICC. In this test case, the command load is successful, and the EOC provides the ASTER ICC with an SCC-stored command load report and an integrated report having orbital events, command execution times, and TDRSS contacts with candidate loads.

The EOC transmits the command load to EDOS for transfer to the TDRS ground terminal, the TDRS, and the AM-1 spacecraft. The EOC verifies receipt of the command load by the AM-1 spacecraft and provides the ASTER ICC with ASTER instrument command uplink status information, which includes command receipt at the EOC, command validation by the EOC, and command receipt by the AM-1 spacecraft.

The expected results are that the EOC generates an AM-1 ATC command load that includes the ASTER DAR observation; notifies the ASTER ICC of command load generation status; and provides the ASTER ICC with instrument command uplink status information.

12.3.3 ASTER DAR Planning, Ingest, Archiving, Processing, and Distribution Sequence

The ASTER DAR Planning, Ingest, Archiving, Processing, and Distribution Sequence verifies ECS capabilities to plan, ingest, process, archive, distribute, and reprocess ASTER data and products at the EDC DAAC. ECS external interfaces with ASTER GDS, ASTER SCF, and NOAA ADC are exercised.

This sequence confirms that the EDC DAAC ingests and archives ASTER Levels 1A and 1B data as well as ancillary data and products and associated metadata required for ASTER product generation. The capabilities of the EDC DAAC to generate, archive, distribute, and reprocess higher-level ASTER products are confirmed.

This sequence verifies that the EDC DAAC plans for the generation of ASTER products requested in the DAR utilizing the production planning database. The EDC DAAC schedules the necessary executions of product generation programs in its candidate and active production plans. The EDC DAAC coordinates with providers of ancillary data needed for ASTER product

generation. The capabilities of the EDC DAAC to ingest and archive, as appropriate, ancillary data, as well as ASTER Levels 1A and 1B data received from the ASTER GDS, are verified.

This sequence confirms that the ASTER product generation programs are initiated using the production schedule and data availability. The ECS capability to perform scheduled processing of ASTER Level 1 standard data to Level 2 products is confirmed. The ECS distributes DAR products generated at the EDC DAAC to the customers specified in the DAR information.

This sequence verifies that the EDC DAAC schedules and performs ASTER reprocessing (due to science software updates), keeps the ASTER SCF updated on reprocessing status, and archives the reprocessed products.

This sequence verifies that the EDC DAAC maintains ingest, processing, archiving, distribution, and reprocessing information on the ancillary data and generated products, as applicable. The capability to log events and transactions and update the product inventory upon archiving generated products is confirmed.

12.3.3.1 Test Case B120330.010-ASTER DAR Production Planning

The ASTER DAR Production Planning test case verifies that the EDC DAAC develops the plans and schedules and coordinates input data needs for generating the AST09 product specified in the DAR. The inputs to this test case include the production request generated in the ASTER DAR Product and Distribution Specification test case (Section 12.3.1.4), product thread information, and resource profiles needed to generate the AST09 product. The Test method is used to verify this test case.

The Production Planner at the EDC DAAC populates and maintains the production planning database. This database forms the basis for creating production plans, which include the AST09 product. Specifically, the database contains production requests and product thread information for the AST09 products, as well as EDC DAAC resource profiles. The production request identifies the ASTER products to be generated, including the AST09 product, and the time range for which the products should be produced. Product thread information provides information about the input data needed to generate the AST09 product. Resource profiles include EDC DAAC resource configurations and characteristics that affect AST09 product generation.

The product thread information indicates that AST09 product generation needs the following data/products as inputs: AST10 product (Scene Classification) generated and archived at the EDC DAAC; MIS05 product (Aerosol Product) generated and archived at the LaRC DAAC; MOD04 (Aerosol Product), MOD07 (O3 Total Burden), MOD30 (Temperature and Moisture Profiles), and MOD38 (Water Vapor, Atmospheric (Thermal IR)) products generated and archived at the GSFC DAAC; the Total Ozone Mapping Spectrometer (TOMS) product already migrated from the Version 0 system and archived at the GSFC DAAC, and NOAA/NMC ancillary data. The AST10 product needs the AST03 product (Registered Radiance at Sensor) as input. The AST03 product, in turn, needs AST02 (Auxiliary Products) as well as ASTER Level 1 data as inputs.

The ECS alerts ancillary data and product providers of the AST09 product. The EDC DAAC places subscriptions with the GSFC DAAC for notifications when the MOD04, MOD07,

MOD30, and MOD38 products and the applicable NOAA/NMC data are archived and when the TOMS product is available. The EDC DAAC also places a subscription with the LaRC DAAC for notification when the MIS05 product is archived at the LaRC DAAC.

The ECS provides the DAAC Production Planner with tools to create several 30-day (nominally) candidate plans updated every 2 weeks and 10-day (nominally) candidate plans updated weekly. Product generation information for the AST02, AST03, AST10, and AST09 products is integrated into these plans at the EDC DAAC. The EDC DAAC plan is made available via subscription to other DAACs and the SMC. The LaRC and GSFC DAACs, which have access to the EDC DAAC production plans and AST09 product dependencies, include MIS05, MOD04, MOD07, MOD30, and MOD38 product generation in their own production plans. Each DAAC has the capability to view the overall ECS-wide plan.

As the production target day approaches, one candidate plan at the EDC DAAC is selected by the operations team as the active plan. This plan covers a 27-hour period and is also known as the daily production schedule. This schedule contains specific ASTER production information and is generated, reviewed, approved, and activated by the applicable DAAC Production Scheduler. Similarly, the Production Scheduler at the LaRC and GSFC DAACs creates a daily production schedule that includes the MIS05, MOD04, MOD07, MOD30, and MOD38 products. The daily production schedules for each affected DAAC are made available via subscription to one another, as well as to other DAACs and the SMC. Each DAAC has the capability to view the overall ECS-wide schedule.

At the end of the production planning process, the EDC, GSFC, and LaRC DAACs generate a Data Processing Request (DPR) for each ASTER, MISR, and MODIS PGE scheduled for execution at the applicable DAAC. DPR information includes PGE identification, input data granule(s), output data granule and archive location, planned start/end execution times, and priority.

The expected results include a properly maintained production planning database containing AST09 product information; incorporating AST02, AST03, AST10, and AST09 product generation, as well as MIS05, MOD04, MOD07, MOD30, and MOD38 product generation, in the production plans and schedules of the EDC, LaRC, and GSFC DAACs, as applicable; displaying these plans and schedules; and creating DPRs for the applicable MISR and MODIS PGEs. Another expected result is that the EDC DAAC alerts ancillary data/product providers on the need for notification when the applicable data/products are available.

12.3.3.2 Test Case B120330.020-ASTER DAR Level 1 Data Ingest and Archiving

The ASTER DAR Level 1 Data Ingest and Archiving test case verifies that the EDC DAAC ingests and archives ASTER Level 1 data that includes the DAR observation, browse data, and associated metadata. The inputs to this test case include the Level 1 data and associated ancillary data, metadata, and browse data that includes the ASTER DAR observation. The Test method is used to verify this test case.

The ASTER GDS sends, to the EDC DAAC, the ASTER Level 1 science data containing the ASTER DAR observation. The EDC DAAC receives the Level 1 science data via physical

electronic media (tape). Browse data associated with the Level 1 data are also received at the EDC DAAC for a similar time/area. The Data Ingest Technician mounts the tape, and the Level 1 data are transferred to working storage, where it is converted, if necessary. The metadata are extracted and checked with no discrepancies found. The Level 1 data are then archived, and the metadata are stored in the applicable science data inventory. Similarly, the browse data are transferred to working storage and converted, if necessary. The browse metadata are checked, but no errors are found. The browse data are then archived and the associated metadata stored in the applicable inventory. The data are staged for use in LIS product generation. The EDC DAAC enters ingest and inventory information into the appropriate logs.

The expected results are that the EDC DAAC properly ingests and archives ASTER Level 1 data and associated ancillary data, metadata, and browse data and updates the appropriate logs.

12.3.3.3 Test Case B120330.030-ASTER DAR Ancillary Data Ingest and Archiving

The ASTER DAR Ancillary Data Ingest and Archiving test case verifies that the EDC DAAC ingests and archives ancillary data and EOSDIS products used in generating the AST09 product requested by the DAR originator. The inputs to this test case include ancillary data and products from NOAA/NMC and the LaRC and GSFC DAACs. The Test method is used to verify this test case.

The AST09 product specified in the DAR has the following non-ASTER, non-EDC DAAC product dependencies: NOAA/NMC data received at the GSFC DAAC and ECS products at the GSFC DAAC (MOD04, MOD07, MOD30, MOD38, and TOMS) and LaRC DAAC (MIS05).

In order to obtain the NMC ancillary data for the AST09 product, the GSFC DAAC polls a designated NMC file list. When the GSFC DAAC identifies the required files, it initiates data transfers via File Transfer Protocol (FTP), to retrieve the NMC data. These data are transferred to the ECS at the GSFC DAAC, where they are archived. The completion of archiving at the GSFC DAAC triggers notification to the EDC DAAC that the NMC ancillary data are available at the GSFC DAAC. The EDC DAAC sends the GSFC DAAC an ingest request specifying the platform and file locations at the EDC DAAC for receiving the NMC data. The GSFC DAAC pushes these data to the EDC DAAC, which ingests the data and makes them available to AST09 product generation.

At the scheduled times, the LaRC and GSFC DAACs generate the MIS05, MOD04, MOD07, MOD30, and MOD38 products, which are used in AST09 product generation. These products are archived, and the archiving triggers the subscriptions (identified in the ASTER DAR Production Planning test case (Section 12.3.3.1)) to notify the EDC DAAC of product availability. The EDC DAAC receives the product availability notices from the LaRC and GSFC DAACs. The EDC DAAC sends these two DAACs an ingest request specifying the platform and file locations at the EDC DAAC for receiving the MIS05, MOD04, MOD07, MOD30, and MOD38 products. The LaRC and GSFC DAACs push these products to the EDC DAAC, which transfers them to working storage for use in AST09 product generation. The metadata are extracted and checked with no discrepancies found. Similarly, the GSFC DAAC sends the TOMS product to the EDC DAAC. The EDC DAAC enters ingest information into the appropriate logs.

An expected result is that the EDC DAAC properly ingests NOAA/NMC ancillary data; MIS05, MOD04, MOD07, MOD30, MOD38, and TOMS products; and associated metadata, which are all archived at, and received from, the GSFC and LaRC DAACs. Additional expected results are that the EDC DAAC updates the ingest log and makes the ancillary data and products available for AST09 product generation.

12.3.3.4 Test Case B120330.040-ASTER DAR Product Generation and Archiving

The ASTER DAR Product Generation and Archiving test case verifies that the EDC DAAC generates and archives ASTER products, including the AST09 product requested by the DAR originator. The inputs to this test case include the EDC DAAC processing schedule and DPRs generated in the ASTER DAR Production Planning test case (Section 12.3.3.1); the ASTER Level 1 data ingested in the ASTER DAR Level 1 Data Ingest and Archiving test case (Section 12.3.3.2); the Digital Elevation Map (DEM) product archived at the EDC DAAC; and NMC, TOMS, MIS05, MOD04, MOD07, MOD30, and MOD38 ancillary data and products ingested in the ASTER DAR Ancillary Data Ingest and Archiving test case (Section 12.3.3.3). The Test method is used to verify this test case.

The Production Scheduler at the EDC DAAC activates the production schedule, and processing resources are initialized. This schedule includes the ASTER products required as inputs to AST09 product generation. When the ASTER Level 1 data and applicable ancillary data and products are available, DPRs for the AST02, AST03, AST10, and AST09 products are validated for source, format, and parameter values. Each DPR is then queued consistent with its priority and resource requirements. When the required resources are available, the input data are staged for the applicable ASTER Product Generation Executables (PGEs). These PGEs are executed according to the EDC DAAC daily production schedule. (The contents of the ASTER products are not verified since the PGEs use science software controlled by the ASTER SCF, rather than by the ECS.)

The AST09 PGEs utilize AST02, AST03, and AST10 output, as well as NMC, TOMS, MIS05, MOD04, MOD07, MOD30, and MOD38 ancillary data and products. Additionally, the DEM product, which has already been migrated from the Version 0 system, is retrieved from the local archive and staged for AST09 PGE use.

Upon completion of product generation, the EDC DAAC updates the product log and sends a product generation status message to the SMC on ASTER processing status. The ASTER products and their associated metadata are archived at the EDC DAAC and an entry is made into the product log indicating archival. The EDC DAAC updates the product inventory, which contains information about ASTER products, including the AST09 product just generated. ASTER inventory information is logged. The completion of product archiving triggers a product availability message, which is sent to the DAR originator, who submitted a subscription for such notification in the ASTER DAR Product and Distribution Specification test case.

A subscription exists to make the new AST09 product available to the ASTER SCF to perform Quality Assurance (QA). Accordingly, the EDC DAAC stages this product for SCF access and sends an e-mail message notifying the SCF of product availability. The SCF receives the e-mail message, retrieves the product, performs QA, and provides the EDC DAAC with resulting QA

information. The EDC DAAC uses this information to complete the QA fields of the AST09 product metadata. The EDC DAAC data quality staff views this QA information.

The expected results are that the EDC DAAC generates and archives ASTER products, including the AST09 DAR product and associated metadata; creates appropriate log entries; and notifies the DAR originator of product availability. Additional expected results include updating the product metadata with QA information received from the ASTER SCF and displaying this information.

12.3.3.5 Test Case B120330.050-ASTER DAR Product Distribution

The ASTER DAR Product Distribution test case verifies that the EDC DAAC distributes the AST09 product and associated metadata to the customers specified in the DAR. The inputs to this test case include the distribution information specified in the ASTER DAR Product and Distribution Specification test case (Section 12.3.1.4) as well as the AST09 product itself and associated metadata. The Demonstration method is used to verify this test case.

The DAR specifies distribution of the AST09 product to the DAR originator via hard media on 4-mm tape, as well as automatic, electronic distribution to the JPL DAAC. The EDC DAAC retrieves the distribution information as well as the AST09 product and associated metadata. For distribution to the JPL DAAC, the EDC DAAC routes the product and metadata electronically and logs distribution information. For distribution to the DAR originator, the Data Distribution Technician at the EDC DAAC mounts the 4-mm tape onto which the product and metadata are copied. The tape is packaged and shipped to the DAR originator. The ECS also sends an e-mail notification of product shipment to the DAR originator. The EDC DAAC logs distribution information and status. The EDC DAAC also generates accounting and resource utilization information and provides this information to the SMC. The SMC generates a bill/invoice associated with the cost of the 4-mm tape and related expenses and distributes it to the user.

The expected results are that the EDC DAAC properly maintains AST09 product distribution information; copies the AST09 product and associated metadata onto hard media; distributes the product and metadata to the DAR originator and JPL DAAC; provides the user with billing information; and updates the log with distribution information. In addition to receiving the AST09 product from the EDC DAAC, the DAR originator and the JPL DAAC receive the special DAR product directly from the ASTER GDS. (However, the distribution of this ASTER GDS product is not verified by the ECS.)

12.3.3.6 Test Case B120330.060-ASTER DAR Product Reprocessing and Archiving

The ASTER DAR Product Reprocessing and Archiving test case verifies that the EDC DAAC reprocesses and archives ASTER products, including the AST09 product generated as a result of the DAR observation. The reprocessing is necessitated by the recent integration of new ASTER science software at the EDC DAAC for the AST09 PGE. The inputs to this test case include reprocessing information provided by the ASTER SCF, the EDC DAAC processing schedule that covers AST09 reprocessing, the ancillary data and products archived in the ASTER DAR Ancillary Data Ingest and Archiving test case (Section 12.3.3.3), and the AST02, AST03, and

AST10 products generated in the ASTER DAR Product Generation and Archiving test case (Section 12.3.3.4). The Test method is used to verify this test case.

The ASTER SCF utilizes a reprocessing request template provided previously by the ECS to provide the EDC DAAC with specific information regarding reprocessing the ASTER products. The information provided by the SCF includes a list of products to be generated, the version numbers of the science software and calibration coefficients, a list of ancillary data, and data start and stop times. NASA approves the reprocessing request, and the EDC DAAC incorporates the reprocessing activities into its production plans.

The EDC DAAC requests transmission, from the GSFC DAAC, of NMC ancillary data and products and the MOD04 products needed for AST09 reprocessing. Similarly, the EDC DAAC requests that the LaRC DAAC send the MIS05 product. The AST09 reprocessing activities are scheduled, and the EDC DAAC sends the resulting schedules to the ASTER SCF.

The EDC DAAC ingests the ancillary data and products needed for AST09 reprocessing. The Production Scheduler at the EDC DAAC activates the production schedule, and reprocessing resources are initialized. DPRs for the AST09 process are validated for source, format, and parameter values. Each DPR is then queued consistent with its priority and resource requirements. When the required resources are available, the AST02, AST03, and AST10 products, which are needed as input to AST09 reprocessing, are retrieved from the local archive. These products as well as ingested ancillary data are staged for the AST09 PGEs. These PGEs are executed according to schedule, and the AST09 product is generated. (The contents of this product are not verified, since the PGEs use science software controlled by the ASTER SCF, rather than by the ECS.)

The AST09 PGEs keep the SCF updated on the status of the reprocessing request. Upon completion of reprocessing, the EDC DAAC updates the product log and sends a message to the SMC and ASTER SCF on AST09 reprocessing status. The reprocessed AST09 product is archived, and the associated metadata are stored in the applicable science data inventory. The EDC DAAC enters ingest, reprocessing, and inventory information into the appropriate logs and notifies the ASTER SCF of completion of reprocessing. The completion of product archiving triggers a product availability message, which is sent to the DAR originator, who submitted a subscription for such notification in the ASTER DAR Product and Distribution Specification test case (Section 12.3.1.4).

The expected results are that the EDC DAAC reprocesses and archives the AST09 DAR product and associated metadata; updates the product log; notifies the DAR originator of product archival; and provides the ASTER SCF with the schedule for reprocessing and notification upon completion of reprocessing.

12.3.4 ASTER DAR Product Access Sequence

The ASTER DAR Product Access Sequence verifies that the ECS provides the capability for ECS and ASTER GDS users to access EDC DAAC and ASTER GDS products. User access to directory, guide, browse, and inventory information, is confirmed. The ECS also provides the

capability for a user to search for, and receive, higher-level products, including those generated as a result of DARs.

This sequence verifies that an authorized ECS user can request ASTER information and higher-level products that are stored at the EDC DAAC and ASTER GDS. The capability for an authorized ASTER GDS user to request ASTER information and products stored at the EDC DAAC is also confirmed. The ECS provides the user with the information and products requested.

For products stored at the ASTER GDS, the ECS transfers an ECS user's request for these products to the ASTER GDS. This sequence verifies that the ECS sends the browse, guide, and inventory search requests specified by the user to the ASTER GDS and forwards the results received from the ASTER GDS to the user The ASTER GDS sends the higher-level products requested directly to the user.

For an ASTER GDS user requesting ECS ASTER browse, guide, inventory information, and higher-level products, the ECS processes the user requests received from the ASTER GDS, accesses the information requested, and transmits the results back to the ASTER GDS. This sequence confirms that the ECS provides product delivery status information to the ASTER GDS, who, in turn, forwards this status to the user. The ECS capability to retrieve the products from the EDC DAAC and send them directly to the ASTER GDS user is verified.

12.3.4.1 Test Case B120340.010-ECS User Access to EDC DAAC ASTER Information

The ECS User Access to EDC DAAC ASTER Information test case verifies that the ECS provides ECS users with directory, guide, and inventory information on ASTER products archived at the EDC DAAC. The inputs to this test case include ASTER directory, guide, and inventory information stored at the EDC DAAC. The Demonstration method is used to verify this test case.

An ECS user accessing the ECS (at the GSFC DAAC, for example) seeks directory and guide information on ASTER products stored at the EDC DAAC. The ECS receives this query, accesses the directory and guide information requested, and provides it to the user. The user then initiates a search of the ASTER inventory and specifies selection criteria that includes the time of the DAR observation. The ECS receives the query, accesses the applicable inventory information, and provides the user with the inventory results. The ECS creates log entries for these search events.

The expected results are that the ECS provides an ECS user with the means for submitting directory, guide, and inventory search queries; receives user queries for this type of information; retrieves the requested information from the database and send it to the user; and creates appropriate log entries.

12.3.4.2 Test Case B120340.020-ECS User Access to EDC DAAC ASTER Products

The ECS User Access to EDC DAAC ASTER Products test case verifies that the ECS provides ECS users with access to ASTER products archived at the EDC DAAC. The inputs to this test case include the ASTER inventory information provided in the ECS User Access to EDC DAAC ASTER Information test case (Section 12.3.4.1) and the AST09 product archived in the ASTER DAR Product Generation and Archiving test case (Section 12.3.3.4). The Demonstration method is used to verify this test case.

The ECS user identified in the ECS User Access to EDC DAAC ASTER Information test case (Section 12.3.4.1) reviews the ASTER inventory results generated in the same test case. The user finds the granules that correspond to the AST09 DAR product and submits a product request for that product. The user wants to receive the product via "FTP pull," whereby the user must take further action to actually access the product. The ECS checks the user's inputs for validity and accepts them as valid. The ECS provides the SMC with a record of the order, which is entered into the data order history database.

The GSFC DAAC passes the product order to the EDC DAAC, which retrieves the AST09 product and associated metadata from the archive and stages it for user access via FTP. The user is still logged in when the product becomes available, and the ECS notifies him/her interactively of product availability. The user initiates an FTP, receives the AST09 product and metadata, and acknowledges completion. The ECS then issues a message to the Data Archive Manager at the EDC DAAC to reclaim space used for staging the AST09 product. The ECS creates log entries for these "pull" product ordering events.

In order to verify that an ASTER product can be "pushed" to an ECS user, the same ECS user submits the same product request, except that the destination site address, log-on identification, and password are provided. The GSFC DAAC passes the product order to the EDC DAAC, which retrieves the AST09 product and metadata from the archive and queues it for transfer via FTP. The ECS then logs on to the destination site address and transfers the AST09 product and metadata there via FTP. The ECS also sends an e-mail notification of product transfer completion to the user and logs off. The ECS creates log entries for these "push" product ordering events.

The expected results are that the ECS receives ECS user queries for EDC DAAC ASTER products; retrieves the requested products and associated metadata; provides the user with requested products and associated metadata via FTP "pull" and FTP "push" methods; and creates appropriate log entries.

12.3.4.3 Test Case B120340.030-ECS User Access to ASTER GDS Information

The ECS User Access to ASTER GDS Information test case verifies that the ECS sends guide, browse, and inventory search requests specified by an ECS user to the ASTER GDS and forwards the results to the user. This test case entails ASTER information stored at the ASTER GDS, whereas the ECS User Access to EDC DAAC ASTER Information test case (Section 12.3.4.1) involves ASTER information stored at the EDC DAAC. The inputs to this test case

include ASTER browse data and guide and inventory information stored at the ASTER GDS. The Demonstration method is used to verify this test case.

An ECS user accessing the ECS (at the GSFC DAAC, for example) submits a query for guide information and browse data stored at the ASTER GDS. The ECS receives the query, analyzes it, and transfers the request to the ASTER GDS. The ECS accepts the resulting guide information and browse data from the ASTER GDS and forwards them to the user. The user then initiates a search of the ASTER inventory and specifies selection criteria that includes the time of the DAR observation. The ECS receives the user query, transfers it to the ASTER GDS, receives the applicable inventory information from the ASTER GDS, and provides the user with the inventory results.

The expected results are that the ECS transfers ECS user queries for ASTER GDS browse data and guide and inventory information to the ASTER GDS; and provides the user with browse, guide, and inventory results received from the ASTER GDS.

12.3.4.4 Test Case B120340.040-ECS User Access to ASTER GDS Products

The ECS User Access to ASTER GDS Products test case verifies that the ECS provides ECS users with access to ASTER products archived at the ASTER GDS. This test case entails ASTER products archived at the ASTER GDS, whereas the ECS User Access to EDC DAAC ASTER Products test case (Section 12.3.4.2) involves ASTER products archived at the EDC DAAC. The inputs to this test case include the ASTER inventory information provided in the ECS User Access to ASTER GDS Information test case (Section 12.3.4.3). The Demonstration method is used to verify this test case.

The ECS user identified in the ECS User Access to ASTER GDS Information test case (Section 12.3.4.3) reviews the ASTER inventory results generated in the same test case. The user finds the granules that correspond to the special ASTER GDS DAR product and submits an order requesting delivery of that product to himself/herself. The ECS transmits the product request to the ASTER GDS, which analyzes the request. The ASTER GDS transmits product status information back to the ECS, which forwards this information to the user.

The user then initiates a query of product delivery status. The ECS transfers this request to the ASTER GDS. In response, the ASTER GDS provides product delivery status information to the ECS. The ECS, in turn, forwards this status to the user.

The expected results are that the ECS transmits requests for ASTER GDS products and delivery status to the ASTER GDS and provides the user with product status information received from the ASTER GDS. The user receives the product requested and associated metadata directly from the ASTER GDS via media, but this capability is not verified by the ECS.

12.3.4.5 Test Case B120340.050-ASTER GDS User Access to EDC DAAC ASTER Information

The ASTER GDS User Access to EDC DAAC ASTER Information test case verifies that the ECS sends guide, browse, and inventory search requests specified by an ASTER GDS user to the ASTER GDS. The inputs to this test case include ASTER browse data and guide and inventory

information stored at the EDC DAAC. The Demonstration method is used to verify this test case.

An ASTER GDS user seeks guide information and browse data stored at the EDC DAAC. The ASTER GDS receives this query, analyzes it, and transfers these requests to the EDC DAAC. The EDC DAAC accesses the guide information and browse data from the ASTER GDS and forwards them to the ASTER GDS, which provides them to the user. The user then initiates a search of the ASTER inventory and specifies selection criteria that includes the time of the DAR observation. The ASTER GDS receives the user query and sends it to the EDC DAAC, which accesses the applicable inventory information, and transmits it to the ASTER GDS. The ECS creates log entries for ECS search events.

The expected results are that the ECS receives ASTER GDS user queries for EDC DAAC ASTER browse data and guide and inventory information from the ASTER GDS; accesses the requested data and information; provides the ASTER GDS with browse, guide, and inventory results; and creates appropriate log entries. The ASTER GDS provides the user with the results, but this capability is not verified by the ECS.

12.3.4.6 Test Case B120340.060-ASTER GDS User Access to EDC DAAC ASTER Products

The ASTER GDS User Access to EDC DAAC ASTER Products test case verifies that the ECS provides ASTER GDS users with access to ASTER products archived at the EDC DAAC. The inputs to this test case include the ASTER inventory information provided in the ASTER GDS User Access to EDC DAAC ASTER Information test case (Section 12.3.4.5). The Demonstration method is used to verify this test case.

The ASTER GDS user identified in the ASTER GDS User Access to EDC DAAC ASTER Information test case (Section 12.3.4.5) reviews the ASTER inventory results generated in the same test case. The user finds the granules that correspond to the AST09 DAR product and submits an order requesting delivery of that product to himself/herself. The ASTER GDS transmits the product request to the EDC DAAC. The EDC DAAC analyzes the request and transmits product status information back to the ASTER GDS. The ASTER GDS, in turn, forwards this information to the user. The EDC DAAC creates log entries for these product ordering events.

The user then initiates a query of product delivery status. The ASTER GDS transfers this request to the EDC DAAC. In response, the EDC DAAC provides product delivery status information to the ASTER GDS. The ASTER GDS, in turn, forwards this status to the user. The EDC DAAC retrieves the AST09 product and associated metadata from the archive. The Data Distribution Technician at the EDC DAAC mounts the tape onto which the product and metadata are copied. The tape is packaged and shipped directly to the user. The ECS also sends an e-mail notification of product shipment to the user (assuming the ECS has received an e-mail address from the ASTER GDS). The EDC DAAC logs distribution information and status. The EDC DAAC also generates accounting and resource utilization information and provides this information to the SMC. The SMC generates a bill/invoice associated with the cost of the hard media and related expenses and distributes it to the user.

The expected results are that the ECS receives ASTER GDS user queries for EDC DAAC ASTER products; retrieves the requested products and associated metadata; provides the ASTER GDS with product status information; sends the product and associated metadata directly to the user; provides the user with billing information; and creates appropriate log entries.

12.4 Hydrology, Earth Radiation, and Atmospheric Dynamics Scenario

The Hydrology, Earth Radiation, and Atmospheric Dynamics Scenario verifies the ECS capability to provide end-to-end science data operations in support of hydrology, earth's radiation, and atmospheric dynamics data, products, and information. This scenario spans the entire range of ECS activities involved in planning, ingesting, processing, archiving, distributing, and reprocessing, as applicable, science data and products for TRMM CERES, LIS, PR, TMI, and VIRS instruments, AM-1 CERES and MODIS instruments, and the Data Assimilation System (DAS).

This scenario is conducted primarily at the GSFC, LaRC, MSFC, EDC, and NSIDC DAACs, although the JPL DAAC and SMC are also involved. ECS external interfaces exercised include SDPF, NOLAN, TSDIS, EDOS, EBnet, the LIS, CERES, and MODIS SCFs, NOAA ADC, Version 0 DAACs, and the DAO local mass storage system.

This scenario confirms that the MSFC DAAC accomplishes the following LIS-related tasks: to plan for the production of higher-level LIS products; to ingest and archive TRMM LIS Level 0 data received from the SDPF via NOLAN; to ingest and archive correlative data needed for LIS products; and to generate, archive, distribute, and reprocess higher-level LIS products.

This scenario verifies that the ECS provides the following capabilities for TSDIS products: to provide TSDIS with ancillary data for the generation of PR, TMI, VIRS, GV, and combined products; to ingest, archive, and distribute these products; to support TSDIS reprocessing of these products; and to ingest and archive the reprocessed products. The GSFC DAAC performs these functions for the VIRS products, and the MSFC DAAC performs these functions for the PR, TMI, GV, and combined products.

The LaRC DAAC capabilities to plan for the generation of higher-level CERES products; to ingest and archive TRMM CERES Level 0 data received from the SDPF via NOLAN and AM-1 CERES Level 0 data received from EDOS via EBnet; and to ingest and archive ancillary data needed for CERES product generation are confirmed. This scenario verifies that the LaRC DAAC also generates, archives, distributes, and reprocesses higher-level CERES products.

This scenario confirms that the GSFC DAAC accomplishes the following MODIS-related tasks: to plan for the production of higher-level MODIS products; to ingest and archive AM-1 MODIS Level 0 data received from EDOS via EBnet; to ingest and archive ancillary data needed for MODIS product generation; and to generate, archive as applicable, distribute, and reprocess certain higher-level MODIS products. The GSFC DAAC also transmits specific higher-level products to the EDC and NSIDC DAACs.

The EDC and NSIDC DAACs provide the capabilities to plan for the production of additional higher-level MODIS products; to ingest and archive specific MODIS products received from the GSFC DAAC; and to generate, archive, distribute, and reprocess additional higher-level MODIS products.

This scenario confirms the ECS capabilities to ingest and stage expedited data for TRMM and AM-1 instruments, to notify specific users of expedited data availability, and to provide notified users access to these data. The capabilities to update the product metadata with quality information, to update the product inventory as products are generated and reprocessed, and to log significant events including data transfers are verified.

The GSFC DAAC capabilities to plan, schedule, and coordinate input data needs for generating DAS First-Look Analysis and Final Analysis products are confirmed. The GSFC DAAC processes, archives, and distributes DAS First-Look Analysis and Final Analysis products. DAS product reanalysis, support to DAO research, and ancillary data ingest and archiving in support of the DAS product generation are confirmed. The capabilities to update product inventories and log significant events for DAS are verified.

12.4.1 LIS Planning, Ingest, Archiving, Processing, and Distribution Sequence

The LIS Planning, Ingest, Archiving, Processing, and Distribution Sequence verifies ECS capabilities to plan, ingest, process, archive, distribute, and reprocess LIS data and products at the MSFC DAAC. ECS external interfaces with SDPF, NOLAN, LIS SCF, and NOAA ADC are exercised.

This sequence confirms that the MSFC DAAC ingests and archives LIS Level 0 standard data, expedited data, correlative data, and associated metadata required for LIS product generation. The capabilities of the MSFC DAAC to generate, archive, distribute, and reprocess higher-level LIS products are confirmed.

This sequence verifies that the MSFC DAAC plans for the generation of LIS products based on information maintained in the production planning database. The MSFC DAAC schedules the necessary executions of product generation programs in its candidate and active production plans. The MSFC DAAC coordinates with providers of correlative data needed for LIS product evaluation. The capabilities of the MSFC DAAC to ingest and archive, as appropriate, correlative data, as well as LIS Level 0 data received from the SDPF, are verified.

This sequence confirms that the LIS product generation programs are initiated using the production schedule and data availability. The ECS capability to perform scheduled processing of LIS Level 0 standard data to higher-level products is confirmed. The ECS provides the capability for authorized users to access LIS standard products and expedited data.

This sequence verifies that the MSFC DAAC schedules and performs LIS reprocessing (due to LIS science software updates), keeps the LIS SCF updated on reprocessing status, and archives the reprocessed products.

This sequence verifies that the MSFC DAAC maintains ingest, processing, archiving, distribution, and reprocessing information on the correlative data and LIS generated products, as

applicable. The capability to log events and transactions and update the product inventory upon archiving generated products is confirmed.

12.4.1.1 Test Case B120410.010-LIS Production Planning

The LIS Production Planning test case verifies that the ECS develops the plans and schedules and coordinates correlative data needs for generating LIS products at the MSFC DAAC. This test case focuses on planning and scheduling the production of the LIS08 product (Vector Product) at MSFC. The inputs to this test case include production requests, product thread information, and data availability predictions for the LIS08 product, as well as MSFC DAAC resource profiles. The Test method is used to verify this test case.

The Production Planner at the MSFC DAAC populates and maintains the production planning database at the MSFC DAAC. This database forms the basis for creating MSFC DAAC production plans and schedules, which include production requests, product thread information, data availability predictions, and resource profiles.

The LIS08 product utilizes only other LIS data/products as inputs to product generation. Specifically, the LIS08 product, which is at Level 3 and includes 11 parameters, utilizes the following Level 2 products as input data: LIS05 (Flash Product), LIS06 (Area Product), and LIS07 (Orbit Product). These three products, in turn, utilize the following Level 1B products as input data: LIS02 (Background Images Product), LIS03 (Events Product), and LIS04 (Group Product). The LIS02, LIS03, and LIS04 products utilize the LIS01 product (Level 1A Product) as input data. Finally, the LIS01 product utilizes the LIS Level 0 data for input. All of these products (LIS01 to LIS08) are generated and archived at the MSFC DAAC.

The LIS08 product utilizes correlative data from non-LIS sources for product validation. The MSFC DAAC places subscriptions with the GSFC DAAC and other data providers, as applicable, for notifications when the applicable correlative data (e.g., GOES, METEOSAT, and GMS Imagery, ground/radar data, and sounding data from NOAA/NESDIS and NOAA/NMC) are available to the MSFC DAAC.

The ECS provides the DAAC Production Planner with tools to create several 30-day (nominally) candidate plans updated every 2 weeks and 10-day (nominally) candidate plans updated weekly. Product generation information for the LIS01 through LIS08 products is integrated into these plans at the MSFC DAAC. The MSFC DAAC plans are made available via subscription to other DAACs and the SMC. Each DAAC has the capability to view the overall ECS-wide plan.

As the production target day approaches, one candidate plan at the MSFC DAAC is selected by the operations team as the active plan. This plan covers a 27-hour period and is also known as the daily production schedule. This schedule contains specific LIS production information and is generated, reviewed, approved, and activated by the MSFC DAAC Production Scheduler. The daily production schedule for the MSFC DAAC is made available via subscription to other DAACs and the SMC. Each DAAC has the capability to view the overall ECS-wide schedule.

At the end of LIS production planning, the MSFC DAAC generates a DPR for each LIS PGE scheduled for execution at the MSFC DAAC. DPR information includes PGE identification,

input data granule(s), output data granule and archive location, planned start/end execution times, and priority.

The expected results include a properly maintained production planning database containing LIS product information at the MSFC DAAC; incorporating LIS01 through LIS08 product generation in the production plans and schedules of the MSFC DAAC; displaying these plans and schedules; and creating DPRs for the applicable LIS PGEs. Another expected result is that the MSFC DAAC alerts correlative data providers, as applicable, on the need for notification when the applicable data/products are available.

12.4.1.2 Test Case B120410.020-LIS Level 0 Data Ingest and Archiving

The LIS Level 0 Data Ingest and Archiving test case verifies that the MSFC DAAC ingests LIS Level 0 data, expedited data, and associated metadata received from the SDPF, archives the Level 0 (non-expedited) data, and stages the expedited data for user access. The inputs to this test case include LIS Level 0 data, expedited data, and associated metadata received from the SDPF; a pre-defined list of expedited data users; and the procedure for purging LIS Level 0 data from the archive. The Test method is used to verify this test case.

The SDPF sends the MSFC DAAC a data availability notice (DAN), which notifies the ECS that LIS Level 0 data, expedited data, and associated metadata, are staged and ready for transfer. (The SDPF sends expedited data, and the associated DANs, to the MSFC DAAC three times per day, plus any special expedited data. The SDPF sends the DANs associated with expedited data within two hours of acquisition completion.) Each DAN includes the following information: the names of the data files, file sizes, and file locations. ECS validates the DAN and schedules to pull the data. ECS then sends a data availability acknowledgment (DAA) message to the SDPF indicating the disposition of the DAN.

The MSFC DAAC transfers each file from the SDPF processor locations specified in the DAN. The files containing expedited data receive priority handling. Each file's name and size is checked against DAN information, and no discrepancies are found. The file transfer result is logged and used in generating the data delivery notice (DDN). The next file is transferred, and the process continues until all files are ingested by the MSFC DAAC.

The MSFC DAAC transfers the ingested LIS data to working storage. The metadata are extracted and checked with no discrepancies found. The LIS expedited data are staged for up to 48 hours so that designated users can access these data. This staging event triggers a subscription to notify a pre-defined list of users of the availability of the expedited data. (The expedited data are neither archived nor used in product generation.) The MSFC DAAC logs expedited data ingest and user notification information.

The MSFC DAAC archives Level 0 (non-expedited) data, and the associated metadata are stored in the applicable science data inventory. These data are staged for use in LIS product generation. The MSFC DAAC logs ingest and archive information and makes entries into the science data inventory.

When all files have been ingested and either staged (expedited data) or archived (non-expedited data), the MSFC DAAC sends a DDN to the SDPF indicating successful completion of file transfer.

To demonstrate that LIS Level 0 data are retained for at least one year before deletion, the MSFC DAAC system time is moved forward by 365 days (relative to the ingest date of the LIS Level 0 data used in this test case). The procedure for purging LIS Level 0 data from the archive is then executed. Following purge procedure completion, the LIS Level 0 archive is inspected for the presence of the data ingested earlier in this test case.

The expected results are that the MSFC DAAC ingests LIS Level 0 and expedited data and associated metadata; stages the expedited data; notifies designated users of expedited data availability; archives the Level 0 (non-expedited) data for at least one year; makes the Level 0 (non-expedited) data available for use in LIS product generation; and updates the appropriate logs.

12.4.1.3 Test Case B120410.030-LIS Correlative Data Ingest and Archiving

The LIS Correlative Data Ingest and Archiving test case verifies that the MSFC DAAC ingests and archives, as necessary, correlative data used in validating the LIS08 product identified in the LIS Production Planning test case (Section 12.4.1.1). The inputs to this test case include NOAA/NESDIS and NOAA/NMC correlative data. The Test method is used to verify this test case.

In order to obtain NMC and NESDIS correlative data for the LIS08 product, the GSFC DAAC polls designated NMC and NESDIS file lists. When the GSFC DAAC identifies the required files, it initiates data transfers via File Transfer Protocol (FTP), to retrieve the NMC data. These data are transferred to the ECS at the GSFC DAAC, where they are archived. The completion of archiving at the GSFC DAAC triggers notifications to the MSFC DAAC that the NMC and NESDIS correlative data are available at the GSFC DAAC. The MSFC DAAC sends the GSFC DAAC an ingest request specifying the platform and file locations at the MSFC DAAC for receiving the NMC data. The GSFC DAAC pushes these data to the MSFC DAAC, which ingests the data and makes them available to LIS08 product validation. The GSFC and MSFC DAACs update their logs with ingest information for all data ingested.

The expected results are that the MSFC DAAC ingests NMC and NESDIS correlative data and associated metadata, which are archived at, and received from, the GSFC DAAC; makes these data available for use in LIS product validation; and updates the ingest logs.

12.4.1.4 Test Case B120410.040-LIS Product Generation and Archiving

The LIS Product Generation and Archiving test case verifies that the MSFC DAAC generates and archives LIS products, including LIS08 products identified in the LIS Production Planning test case (Section 12.4.1.1). The inputs to this test case include the MSFC DAAC daily production schedule and DPRs generated in the LIS Production Planning test case (Section 12.4.1.1), the LIS Level 0 data ingested in the LIS Level 0 Data Ingest and Archiving test case

(Section 12.4.1.2), and QA information from the LIS SCF. The Test method is used to verify this test case.

The Production Scheduler at the MSFC DAAC activates the production schedule, and processing resources are initialized. This schedule includes the LIS products required as inputs to further LIS product generation. When the LIS Level 0 data are available, DPRs for the LIS01 through LIS08 products are validated for source, format, and parameter values. Each DPR is then queued consistent with its priority and resource requirements. When the required resources are available, the input data are staged for the applicable LIS PGEs. These PGEs are executed according to the daily production schedule. (The contents of the LIS products are not verified since the PGEs use science software controlled by the LIS SCF, rather than by the ECS.)

Upon completion of LIS01 through LIS08 product generation, the MSFC DAAC updates the product log and sends a product generation status message to the SMC on LIS processing status. The LIS products and their associated metadata are archived at the MSFC DAAC and entries are made into the product log indicating archival. The MSFC DAAC updates the product inventory, which contains information about LIS products, including those just generated. LIS product inventory information is logged.

A subscription exists to make the new LIS08 product available to the LIS SCF to perform QA. Accordingly, the MSFC DAAC stages this product for SCF access and sends an e-mail message notifying the SCF of product availability. The SCF receives the e-mail message, retrieves the product, performs QA, and provides the MSFC DAAC with resulting QA information. The MSFC DAAC uses this information to complete the QA fields of the LIS08 product metadata. The MSFC DAAC data quality staff views this QA information.

The expected results are that the MSFC DAAC generates and archives LIS01 through LIS08 products and associated metadata; updates product metadata with QA information received from the LIS SCF; displays QA information; and creates appropriate log entries.

12.4.1.5 Test Case B120410.050-LIS Product Distribution

The LIS Product Distribution test case verifies that the ECS processes user requests for LIS products and correlative data and distributes the products and data requested. In this test case, the users already know which products and data they want to receive. The inputs to this test case include ECS tools/displays for ordering LIS products and correlative data; the correlative data described in the LIS Correlative Data Ingest and Archiving test case (Section 12.4.1.3); LIS08 products and correlative data archived in the LIS Product Generation and Archiving test case (Section 12.4.1.4); Special Sensor Microwave/Imager (SSM/I) correlative data archived at the MSFC DAAC; and the LIS expedited data staged in the LIS Level 0 Data Ingest and Archiving test case (Section 12.4.1.2). The Demonstration method is used to verify this test case.

The ECS provides a user accessing the ECS (at the GSFC DAAC, for example) with information and displays on submitting an order for a one-time distribution of specific LIS08 products and correlative data. The user enters/modifies the parameters needed for requesting electronic distribution of these products and data to himself/herself. The user also provides his/her site address, log-on identification, and password.

The ECS checks the user's distribution inputs for validity and accepts them as valid. The ECS provides the SMC with a record of the order, which is entered into the data order history database. The GSFC DAAC passes the request to the MSFC DAAC, which retrieves, from the MSFC DAAC archive, the LIS08 products, SSM/I correlative data already migrated from the Version 0 system, and associated metadata and queues these products for transfer via FTP. The ECS then logs on to the user's site address and transfers the LIS08 products, correlative data, and metadata to the user via FTP. The ECS also sends an e-mail notification of product transfer completion to the user and logs off. The GSFC DAAC provides the user with the NMC and NESDIS correlative data directly, since these data are stored at the GSFC DAAC. The ECS creates log entries for these product ordering events.

When each product and correlative data have been distributed to the user, the ECS sends an e-mail notification of product/data transfer completion to the user and logs off. The ECS creates log entries for all product/data ordering events.

To demonstrate user access to expedited data, a user who has been notified of LIS expedited data availability submits a request to receive expedited data. The request is submitted within 48 hours of expedited data receipt at the MSFC DAAC. (The associated non-expedited Level 0 data have not yet been archived). The MSFC DAAC retrieves the requested data from the staging disk and sends these data to the user. The ECS creates appropriate log entries.

The expected results are that the ECS receives LIS product and correlative data distribution parameters from the user; validates distribution inputs; retrieves LIS08 products, correlative data, and associated metadata from the MSFC DAAC archive; provides the user with requested products, correlative data, and associated metadata; provides notified users with access to expedited data; and creates appropriate log entries.

12.4.1.6 Test Case B120410.060-LIS Product Reprocessing and Archiving

The LIS Product Reprocessing and Archiving test case verifies that the MSFC DAAC reprocesses and archives LIS products, including the LIS08 product. The reprocessing is necessitated by the simulated integration of new LIS science software at the MSFC DAAC for the LIS08 PGEs. The inputs to this test case include reprocessing information provided by the LIS SCF, the MSFC DAAC processing schedule that covers LIS08 reprocessing, and the LIS01 through LIS07 products generated in the LIS Product Generation and Archiving test case (Section 12.4.1.4). The Test method is used to verify this test case.

The LIS SCF utilizes a reprocessing request template provided previously by the ECS to provide the MSFC DAAC with specific information regarding reprocessing the LIS08 product. The information provided by the SCF includes a list of products to be generated, the version numbers of the science software and calibration coefficients, and data start and stop times. NASA approves the reprocessing request, and the MSFC DAAC incorporates the reprocessing activities into its production plans.

The LIS08 reprocessing activity is scheduled, and the MSFC DAAC sends the resulting schedule to the LIS SCF.

The Production Scheduler at the MSFC DAAC activates the production schedule, and reprocessing resources are initialized. DPRs for the LIS08 product are validated for source, format, and parameter values. Each DPR is then queued consistent with its priority and resource requirements. When the required resources are available, the LIS01 through LIS07 products, which are needed as input for LIS08 reprocessing, are retrieved from the local archive and staged for the LIS08 PGEs. These PGEs are executed according to schedule. (The contents of the LIS08 product are not verified since the PGEs use science software controlled by the LIS SCF, rather than by the ECS.)

The LIS08 PGE keeps the SCF updated on the status of the reprocessing. Upon completion of reprocessing, the MSFC DAAC updates the product log and sends a message to the SMC and LIS SCF on LIS08 reprocessing status. Successful generation of the LIS08 product results in its archiving, and the associated metadata are stored in the applicable science data inventory. The MSFC DAAC enters ingest, reprocessing, and inventory information into the appropriate logs and notifies the LIS SCF of completion of reprocessing.

The expected results are that the MSFC DAAC reprocesses and archives LIS08 product and associated metadata; updates the product log; and provides the LIS SCF with the schedule for reprocessing and notification upon completion of reprocessing.

12.4.2 TSDIS Products Ingest, Archiving, and Distribution Sequence

The TSDIS Products Ingest, Archiving, and Distribution Sequence verifies ECS capabilities to ingest, archive, and distribute, TRMM products received at the GSFC and MSFC DAACs from TSDIS. The ECS provides TSDIS with ancillary data for both initial product generation and reprocessing. ECS external interfaces with TSDIS, and NOAA ADC are exercised.

This sequence verifies that the GSFC and MSFC DAACs support TSDIS original product generation by ingesting and archiving ancillary data needed by TSDIS and sending these data to TSDIS. The TSDIS products generated are sent to the ECS for archiving and distribution.

This sequence confirms the ECS capabilities to ingest and archive original TRMM products, browse products, associated metadata, and platform ephemeris received from TSDIS. The GSFC DAAC performs these functions for VIRS products, and the MSFC DAAC accomplishes these tasks for TMI, PR, GV, and combined products. The ECS provides the capability for authorized users to access these products.

This sequence verifies that the GSFC and MSFC DAACs support reprocessing of TSDIS products by sending ancillary data and original VIRS, PR, TMI, GV, and combined products to TSDIS. The reprocessed products are transmitted to the ECS. The GSFC DAAC ingests and archives VIRS products, and the MSFC DAAC performs these functions for TMI, PR, GV, and combined products.

This sequence verifies that the GSFC and MSFC DAACs maintain ingest, archiving, and distribution information on the ancillary data and TSDIS-generated products, as applicable. The capability to log events and transactions and update the product inventory upon archiving TSDIS-generated products is confirmed.

12.4.2.1 Test Case B120420.010-TSDIS Processing Support

The TSDIS Processing Support test case verifies that the ECS ingests and archives NMC, SSM/I, Global Precipitation Climatology Project (GPCP), and Global Precipitation Climatology Center (GPCC) ancillary data and provides TSDIS with these data as an input to generating VIRS, TMI, PR, GV and combined products. This test case assumes that the SSM/I, GPCP, and GPCC data have already been migrated to the ECS at the MSFC DAAC. The inputs to this test case include NMC, SSM/I, GPCP, and GPCC ancillary data for TSDIS product generation. The Demonstration method is used to verify this test case.

TSDIS submits a subscription to the GSFC DAAC to obtain NMC ancillary data for use in generating VIRS products. The GSFC DAAC acknowledges and registers the subscription. The GSFC DAAC polls a designated NMC file list that is included in a product availability list previously provided by NMC. When the GSFC DAAC identifies the required files, it initiates data transfers via FTP to retrieve the NMC ancillary data. The GSFC DAAC extracts and checks the associated metadata; no discrepancies are found. The NMC data are then archived, which triggers the subscription to notify TSDIS of NMC ancillary data availability.

The GSFC DAAC sends a DAN to inform TSDIS of the availability and filename of the NOAA ancillary data. TSDIS initiates an FTP to retrieve the NMC data from the GSFC DAAC for generating VIRS products. Upon successful completion of the FTP, TSDIS notifies the GSFC DAAC, via a DDN, of successful NMC data transfer. The GSFC DAAC, in turn, acknowledges, via Data Delivery Acknowledgment (DDA), the data transfer to TSDIS and enters ingest, archive, and distribution information into the appropriate logs.

Similarly, TSDIS submits subscriptions to the MSFC DAAC to obtain SSM/I, GPCP, and GPCC ancillary data for use in generating TMI, PR, GV, and combined products. The MSFC DAAC acknowledges and registers the subscriptions. Since the SSM/I, GPCP, and GPCC data are already stored within the ECS at the MSFC DAAC, the MSFC DAAC sends DANs to inform TSDIS of the availability and filenames of the SSM/I, GPCP, and GPCC ancillary data. TSDIS initiates FTPs to retrieve these data from the MSFC DAAC for generating TMI, PR, GV, and combined products. Upon successful completion of the FTP, TSDIS notifies the MSFC DAAC, via DDN, of successful SSM/I, GPCP, and GPCC data transfer. The MSFC DAAC, in turn, acknowledges, via DDA, the data transfer to TSDIS and enters ingest, archive, and distribution information into the appropriate logs.

An expected result is that the GSFC DAAC ingests and archives NMC ancillary data received from NOAA. Additional expected results are that the GSFC and MSFC DAACs provide TSDIS with NMC, SSM/I, GPCP, and GPCC data, as appropriate, for use in generating VIRS, TMI, PR, GV, and combined products; and create appropriate log entries.

12.4.2.2 Test Case B120420.020-TSDIS Products Ingest and Archiving

The TSDIS Products Ingest and Archiving test case verifies that the GSFC and MSFC DAACs ingest and archive TSDIS standard products, browse products, associated metadata, and platform ephemeris. The inputs to this test case include original VIRS, TMI, PR, GV, and combined

products, browse products, associated metadata, and platform ephemeris generated by TSDIS. The Test method is used to verify this test case.

TSDIS sends the GSFC DAAC a DAN, which notifies the GSFC DAAC that VIRS Level 1A and 1B products, browse products, associated metadata, and platform ephemeris are staged and ready for transfer. The DAN includes the names of the data files, file sizes, and file locations. The GSFC DAAC validates the DAN, sends a Data Availability Acknowledgement (DAA) message to TSDIS, and schedules to pull the data.

The GSFC DAAC transfers each file from the TSDIS locations specified in the DANs. Each file's name and size is checked against DAN information, and no discrepancies are found. The file transfer result is logged and used in generating a DDN. The next file is transferred, and the process continues until all files are ingested by the GSFC DAAC. The GSFC DAAC transfers the products to working storage. The metadata are extracted and checked with no discrepancies found. The products are then archived, and the metadata are stored in the applicable science data inventory. The GSFC DAAC logs ingest and archive information. When all files have been transferred, ingested and archived, the GSFC DAAC sends a DDN to TSDIS indicating successful completion of file transfer and archiving.

Similarly, TSDIS sends the MSFC DAAC a DAN, which notifies the MSFC DAAC that TMI, PR, GV, and combined products (Level 1A-3B), browse products, associated metadata, and platform ephemeris are staged and ready for transfer. The MSFC DAAC validates the DAN, sends a DAA to TSDIS, and schedules to pull the data.

The MSFC DAAC retrieves the TMI, PR, GV, and combined products from TSDIS. The metadata are extracted and checked with no discrepancies found. The products are then archived, and the metadata are stored in the applicable science data inventory. The MSFC DAAC logs ingest and archive information. When all files have been transferred, ingested and archived, the MSFC DAAC sends a DDN to TSDIS indicating successful completion of file transfer and archiving.

The expected results are that the GSFC DAAC ingests and archives original VIRS Level 1A and 1B products, browse products, associated metadata, and platform ephemeris received from TSDIS; that the MSFC DAAC ingests and archives original TMI, PR, GV, and combined products (Level 1A-3B), browse products, associated metadata, and platform ephemeris received from TSDIS; and that both DAACs update the appropriate logs.

12.4.2.3 Test Case B120420.030-TSDIS Products Distribution

The TSDIS Products Distribution test case verifies that the ECS processes user requests for VIRS, TMI, PR, GV, and combined products and browse products and distributes the specified products. In this test case, the user already knows which products he/she desires to receive. The inputs to this test case include the VIRS, TMI, PR, GV, and combined products, browse products, and associated metadata archived in the TSDIS Products Ingest and Archiving test case (Section 12.4.2.2). The Demonstration method is used to verify this test case.

A TRMM Science User (TSU) accessing TSDIS requests a one-time distribution of archived VIRS, TMI, PR, GV, and combined products. The TSU specifies electronic distribution of VIRS

products but 8-mm tape distribution of TMI, PR, GV, and combined products. The TSU also provides his/her e-mail address and physical mailing address.

TSDIS sends a data request to the GSFC DAAC on behalf of the TSU. The GSFC DAAC checks the user's distribution inputs for validity and accepts them as valid. The GSFC DAAC sends a data request acknowledgment to TSDIS and provides the SMC with a record of the order, which is entered into the data order history database. The GSFC DAAC processes the request for VIRS products and passes the request for TMI, PR, GV, and combined products to the MSFC DAAC.

The GSFC DAAC retrieves the VIRS browse products and associated metadata from storage. The GSFC DAAC also retrieves the specified VIRS Level 1A and 1B products and associated metadata from the archive. These products and data are staged for TSU retrieval. The GSFC DAAC then e-mails a DAN to the TSU, indicating the file locations and expiration time of the products and data. The TSU, upon receiving the DAN, pulls the VIRS products and associated data from the GSFC DAAC via FTP. The ECS creates log entries for these product ordering events.

The MSFC DAAC, which receives TSU request information from the GSFC DAAC, retrieves the browse products for TMI, PR, GV, and combined products as well as associated metadata from storage. The MSFC DAAC also retrieves the specified Level 1A-3B TMI, PR, GV, and combined products and associated metadata from the archive. The Data Distribution Technician at the MSFC DAAC mounts the 8-mm tape onto which the products and metadata are copied. The tape is packaged and shipped to the TSU. The ECS also e-mails a DAN to the TSU indicating the date of shipment. The MSFC DAAC logs distribution information and status. The MSFC DAAC also generates accounting and resource utilization information and provides this information to the SMC. The SMC, as necessary, generates a bill/invoice associated with the cost of the 8-mm tape and related expenses and distributes it to the TSU.

The expected results are that the ECS receives TSDIS data requests, on behalf of a TSU, for TSDIS products and associated data; validates request inputs; retrieves the requested VIRS products, browse products, and associated metadata from the GSFC DAAC archive; retrieves the requested TMI, PR, GV, and combined products, browse products, and associated metadata from the MSFC DAAC archive; provides the TSU with the requested products and associated metadata electronically and via 8-mm tape, as specified; generates accounting and resource utilization information; and creates appropriate log entries.

12.4.2.4 Test Case B120420.040-TSDIS Reprocessing Support

The TSDIS Reprocessing Support test case verifies that the ECS provides TSDIS with archived NMC, SSM/I, GPCP, and GPCC ancillary data; VIRS, TMI, PR, GV, and combined products; and platform ephemeris for use in reprocessing VIRS, TMI, PR, GV, and combined products. The inputs to this test case include NMC, SSM/I, GPCP, and GPCC ancillary data archived in the TSDIS Processing Support test case (Section 12.4.2.1); and VIRS, TMI, PR, GV, and combined products and platform ephemeris archived in the TSDIS Products Ingest and Archiving test case (Section 12.4.2.2). The Demonstration method is used to verify this test case.

TSDIS submits subscriptions and data requests to the GSFC DAAC to obtain NMC ancillary data, VIRS products, and platform ephemeris archived at the GSFC DAAC. The GSFC DAAC acknowledges and registers these subscriptions and data requests. The GSFC DAAC sends a DAN to inform TSDIS of the availability and filenames of the NMC data, VIRS products, and platform ephemeris. TSDIS initiates FTPs to retrieve these data and products from the GSFC DAAC. Upon successful completion of the NMC and VIRS transfers, TSDIS notifies the GSFC DAAC, via DDN, of successful transfer. The GSFC DAAC, in turn, acknowledges the data transfer via DDA to TSDIS and enters distribution information into the appropriate logs.

Similarly, TSDIS submits subscriptions and data requests to the MSFC DAAC to obtain SSM/I, GPCP, and GPCC ancillary data, TMI, PR, GV, and combined products, and platform ephemeris archived at the MSFC DAAC. The MSFC DAAC acknowledges and queues these subscriptions and data requests. The MSFC DAAC sends a DAN to inform TSDIS of the availability and filenames of the SSM/I, GPCP, and GPCC data, TMI, PR, GV, and combined products, and platform ephemeris. TSDIS initiates FTPs to retrieve these data and products from the MSFC DAAC. Upon successful completion of the data and product transfers, TSDIS notifies the MSFC DAAC, via DDN, of successful transfer. The MSFC DAAC, in turn, acknowledges the data transfer via DDA to TSDIS and enters distribution information into the appropriate logs.

The expected results are that the GSFC DAAC provides TSDIS with NMC ancillary data, VIRS products, and platform ephemeris; that the MSFC DAAC provides TSDIS with SSM/I, GPCP, and GPCC ancillary data, TMI, PR, GV, and combined products, and platform ephemeris; and that both DAACs create appropriate log entries.

12.4.2.5 Test Case B120420.050-TSDIS Reprocessed Products Ingest and Archiving

The TSDIS Reprocessed Products Ingest and Archiving test case verifies that the GSFC and MSFC DAACs ingest and archive TSDIS standard products, browse products, and associated metadata. The inputs to this test case include reprocessed VIRS, TMI, PR, GV, and combined products, browse products, and associated metadata generated by TSDIS (using the data and products provided by the ECS in the TSDIS Reprocessing Support test case (Section 12.4.2.4). The Test method is used to verify this test case.

TSDIS sends the GSFC DAAC a DAN, which notifies the GSFC DAAC that VIRS Level 1A and 1B products, browse products, and associated metadata are staged and ready for transfer. The DAN includes the names of the data files, file sizes, and file locations. The GSFC DAAC validates the DAN, sends a Data Availability Acknowledgement (DAA) message to TSDIS, and schedules to pull the data.

The GSFC DAAC transfers each file from the TSDIS locations specified in the DANs. Each file's name and size is checked against DAN information, and no discrepancies are found. The file transfer result is logged and used in generating a DDN. The next file is transferred, and the process continues until all files are ingested by the GSFC DAAC. The GSFC DAAC transfers the products to working storage. The metadata are extracted and checked with no discrepancies found. The products are then archived, and the metadata are stored in the applicable science data inventory. The GSFC DAAC logs ingest and archive information. When all files have been

transferred, ingested and archived, the GSFC DAAC sends a DDN to TSDIS indicating successful completion of file transfer and archiving.

Similarly, TSDIS sends the MSFC DAAC a DAN, which notifies the MSFC DAAC that TMI, PR, GV, and combined products (Level 1A-3B), browse products, and associated metadata are staged and ready for transfer. The MSFC DAAC validates the DAN, sends a DAA to TSDIS, and schedules to pull the data.

The MSFC DAAC retrieves the TMI, PR, GV, and combined products from TSDIS. The metadata are extracted and checked with no discrepancies found. The products are then archived, and the metadata are stored in the applicable science data inventory. The MSFC DAAC logs ingest and archive information. When all files have been transferred, ingested and archived, the MSFC DAAC sends a DDN to TSDIS indicating successful completion of file transfer and archiving.

To verify that original VIRS Level 1A and 1B products are retained in the archive for 6 months after reprocessing, the GSFC DAAC system time is moved forward by 180 days (relative to the ingest date of the reprocessed VIRS products used in this test case). The procedure for purging VIRS products from the GSFC DAAC archive is then executed. Following purge procedure completion, the archive is checked for the presence of the corresponding original VIRS products ingested in the TSDIS Products Ingest and Archiving test case (Section 12.4.2.2). A similar set of events is executed at the MSFC DAAC to verify the retention of original TMI, PR, GV, and combined products.

The expected results are that the GSFC DAAC ingests and archives reprocessed VIRS Level 1A and 1B products, browse products, and associated metadata received from TSDIS; that the MSFC DAAC ingests and archives reprocessed TMI, PR, GV, and combined products (Level 1A-3B), browse products, and associated metadata received from TSDIS; and that both DAAC update the appropriate logs.

12.4.3 CERES Planning, Ingest, Archiving, Processing, and Distribution Sequence

The CERES Planning, Ingest, Archiving, Processing, and Distribution Sequence verifies ECS capabilities to plan, ingest, process, archive, distribute, and reprocess CERES data and products at the LaRC DAAC. ECS external interfaces with SDPF, NOLAN, EDOS, EBnet, CERES SCF, and NOAA ADC are exercised.

This sequence confirms that the LaRC DAAC ingests and archives CERES Levels 0 standard data, expedited data, ancillary data and products, and associated metadata required for CERES product generation. The capabilities of the LaRC DAAC to generate, archive, distribute, and reprocess higher-level CERES products are confirmed.

This sequence verifies that the LaRC DAAC plans for the generation of CERES products based on information maintained in the production planning database. The LaRC DAAC schedules the necessary executions of product generation programs in its candidate and active production plans. The LaRC DAAC coordinates with providers of ancillary data needed for CERES product generation. The capabilities of the LaRC DAAC to ingest and archive, as appropriate, ancillary

data, as well as CERES Level 0 data received from both the SDPF via NOLAN and EDOS via EBnet, are verified.

This sequence confirms that the CERES product generation programs are initiated using the production schedule and data availability. The ECS capability to perform scheduled processing of CERES Level 0 standard data to higher-level products is confirmed. The capability of the LaRC DAAC to interface with the CERES SCF to request and receive CERES product quality information is also confirmed. The ECS provides the capability for authorized users to access CERES standard products and expedited data.

This sequence verifies that the LaRC DAAC schedules and performs CERES reprocessing (due to science software updates), keeps the CERES SCF updated on reprocessing status, and archives the reprocessed products.

This sequence verifies that the ECS maintains ingest, processing, archiving, distribution, and reprocessing information on the ancillary data and generated products, as applicable. The capability to log events and transactions and update the product inventory upon archiving generated products is confirmed.

12.4.3.1 Test Case B120430.010-CERES Production Planning

The CERES Production Planning test case verifies that the ECS develops the plans and schedules and coordinates input data needs for generating CERES products at the LaRC DAAC. This test case focuses on planning and scheduling the execution of the CERES 4aF (Determine Cloud Properties (Subsystem 4-VIRS)) process, 4bAF (Determine Cloud Properties (Subsystem 4-MODIS)) process, and 3bTA (Multi Sat Earth Radiation Budget Experiment (ERBE) Monthly (Subsystem 3)) process. These processes have been selected for this test case because the CERES 4aF and 4bAF processes utilize inputs from other ECS DAACs, and the CERES 3bTA process uses input data from both TRMM CERES as well as AM-1 CERES instruments. The inputs to this test case include production requests, product thread information, and data availability predictions for CERES 4aF, 4bAF, and 3bTA processes, as well as LaRC DAAC resource profiles. The Test method is used to verify this test case.

The Production Planner at the LaRC DAAC populates and maintains the production planning database at the LaRC DAAC. This database forms the basis for creating LaRC DAAC production plans and schedules, which include production requests, product thread information, data availability predictions, and resource profiles. The CERES 4aF, 4bAF, and 3bTA processes, key input files, and related information are depicted in Table 12-1.

The ECS alerts, and coordinates with ancillary data providers of the CERES 4AF and 4bAF processes. The LaRC DAAC places subscriptions with the GSFC DAAC for notification when the CER16T_P, CERX05, CERX06, CERX07, CER16A_P, and CERX04A files are available. The LaRC DAAC also notifies the MSFC DAAC of the need for the CERX08 file.

The CERES 4aF and 4bAF processes are scheduled hourly, and the 3bTA process is scheduled monthly. This test case assumes the target day coincides with the same day that the monthly 3bTA process is run.

Table 12-1. Sample CERES Processes and Key Inputs

Process	Input Files/Data	Input File Location	Input File Generation Process (CERES/ LaRC files only)
4aF	CER09T (TRMM CERES Instrument Earth Scans) CER16T_P (VIRS Clear Reflectance History) CERX05 (VIRS Cloud Imager Data) CERX06 (Meteorological, Ozone, & Aerosols) CERX07 (Surface Map) CERX08 (TMI Microwave Water Path) Internal Ancillary Data	LaRC GSFC GSFC GSFC GSFC MSFC LaRC	1aT
1aT	TRMM CERES Level 0 Data	SDPF	
4bAF	CER09A1 (AM-1 CERES Instrument Earth Scans-CTS) CER09A2 (AM-1 CERES Instrument Earth Scans-RAPS) CER16A_P (MODIS Clear Reflectance History) CERX04A (MODIS Cloud Imager Data) CERX06 (Meteorological, Ozone, & Aerosols) CERX07 (Surface Map) CERX08 (TMI Microwave Water Path) Internal Ancillary Data	LaRC LaRC GSFC GSFC GSFC GSFC MSFC LaRC	1aA 1bA
1aA	AM-1 CERES Level 0 Data	EDOS	
1bA	AM-1 CERES Level 0 Data	EDOS	
3bTA	CERX02T (TRMM CERES ERBE-Like Daily Database) CERX02A (AM-1 CERES ERBE-Like Daily Database) Internal Ancillary Data	LaRC LaRC LaRC	2bT 2bA
2bT	CERX02TN (TRMM CERES ERBE-Like Daily Database (non-sort))	LaRC	2aT
2bA	CERX02AN (AM-1 CERES ERBE-Like Daily Database (non-sort)	LaRC	2aA
2aT	CER01T (TRMM CERES Bi-Directional Scans)	LaRC	1aT
2aA	CER01A1 (AM-1 CERES Bi-Directional Scans)	LaRC	1aA
1aT	TRMM CERES Level 0 Data	SDPF	
1aA	AM-1 CERES Level 0 Data	EDOS	

The ECS provides the DAAC Production Planner with tools to create several 30-day (nominally) candidate plans updated every 2 weeks and 10-day (nominally) candidate plans updated weekly. Product generation information for the CERES processes listed in Table 12-1 is integrated into these plans at the LaRC DAAC. The LaRC DAAC plans are made available via subscription to other DAACs and the SMC. The GSFC and MSFC DAACs, which have access to the LaRC DAAC production plans and CERES product dependencies, includes CER16A_P, and CERX04A product generation, in its own production plans. Each DAAC has the capability to view the overall ECS-wide plan.

As the production target day approaches, one candidate plan at the LaRC DAAC is selected by the operations team as the active plan. This plan covers a 27-hour period and is also known as the daily production schedule. This schedule contains specific CERES production information and is generated, reviewed, approved, and activated by the LaRC DAAC Production Scheduler. The daily production schedule for the LaRC DAAC is made available via subscription to other DAACs and the SMC. Each DAAC has the capability to view the overall ECS-wide schedule.

At the end of CERES production planning, the LaRC DAAC generates a DPR for each CERES PGE scheduled for execution at the LaRC DAAC. DPR information includes PGE identification, input data granule(s), output data granule and archive location, planned start/end execution times, and priority.

The expected results include a properly maintained production planning database containing CERES product information at the LaRC DAAC; incorporating 1aA, 1bA, 1aT, 2aA, 2aT, 2bA, 2bT, 3bTA, 4aF, and 4bAF processes in the production plans and schedules of the LaRC DAAC; displaying these plans and schedules; and creating DPRs for the applicable CERES PGEs. Another expected result is that the LaRC DAAC alerts the GSFC and MSFC DAACs of the need for notification when the applicable data/products are available.

12.4.3.2 Test Case B120430.020-CERES Level 0 Data Ingest and Archiving

The CERES Level 0 Data Ingest and Archiving test case verifies that the LaRC DAAC ingests CERES Level 0 data, expedited data, and associated metadata received from the SDPF and EDOS, archives the Level 0 (non-expedited) data, and stages the expedited data. The inputs to this test case include CERES Level 0 data and associated metadata received from both the SDPF and EDOS; expedited data received from the SDPF; expedited data received from EDOS (resulting from the expedited data request initiated in the AM-1 Final Scheduling test case (Section 12.2.1.4)); a pre-defined list of expedited data users; and the procedure for purging CERES Level 0 data from the archive. The Test method is used to verify this test case.

The SDPF sends the LaRC DAAC a DAN, which notifies the ECS that TRMM CERES Level 0 data, expedited data, and associated metadata are staged and ready for transfer. (The SDPF sends expedited data, and the associated DANs, to the LaRC DAAC three times per day, plus any special expedited data. The SDPF sends the DANs associated with expedited data within two hours of acquisition completion.) ECS validates the DAN and schedules to pull the data. ECS then sends a DAA message to the SDPF indicating the disposition of the DAN.

The LaRC DAAC transfers each file from the SDPF processor locations specified in the DAN. The files containing expedited data receive priority handling. Each file's name and size is checked against DAN information, and no discrepancies are found. The file transfer result is logged and used in generating the data delivery notice DDN. The next file is transferred, and the process continues until all files are ingested by the LaRC DAAC. When all files have been ingested from the SDPF, the LaRC DAAC sends a DDN to the SDPF indicating successful completion of file transfer.

EDOS periodically transfers AM-1 CERES Level 0 data, expedited data, and associated metadata to the LaRC DAAC. At the completion of this transfer, EDOS sends Production Data Set (PDS) delivery records, which provide information on the data just transmitted. The LaRC DAAC polls the file containing new PDS delivery records. When the new PDS delivery records are detected, the LaRC DAAC initiates data transfers via FTP to retrieve the Level 0 and expedited data from the files specified by the PDS delivery records. The Level 0 data are ingested and an ingest status is passed to EDOS.

The LaRC DAAC transfers the ingested CERES data received from both the SDPF and EDOS to working storage. The metadata are extracted and checked with no discrepancies found. The CERES expedited data are staged for up to 48 hours so that designated users can access these data. This staging event triggers a subscription to notify a pre-defined list of users of the availability of the expedited data. (The expedited data are neither archived nor used in product generation.) The LaRC DAAC logs expedited data ingest and user notification information.

The LaRC DAAC archives Level 0 (non-expedited) data, and the associated metadata are stored in the applicable science data inventory. These data are staged for use in CERES product generation. The LaRC DAAC logs ingest and archive information and makes entries into the science data inventory.

To verify that CERES Level 0 (non-expedited) data are retained for at least one year before deletion, the LaRC DAAC system time is moved forward by 365 days (relative to the ingest date of the CERES Level 0 non-expedited data used in this test case). The procedure for purging CERES Level 0 data from the archive is then executed. Following purge procedure completion, the CERES Level 0 archive is checked for the presence of the data ingested earlier in this test case.

The expected results are that the LaRC DAAC properly ingests CERES Level 0 and expedited data and associated metadata from the SDPF and EDOS; stages the expedited data for distribution to special users; notifies designated users of expedited data availability; archives the Level 0 (non-expedited) data for at least one year; makes the Level 0 (non-expedited) data available for use in CERES product generation; and updates the appropriate logs.

12.4.3.3 Test Case B120430.030-CERES Ancillary Data Ingest and Archiving

The CERES Ancillary Data Ingest and Archiving test case verifies that the LaRC DAAC ingests and archives, as necessary, ancillary data and EOSDIS products used in generating the CERES products identified in the CERES Production Planning test case (Section 12.4.3.1). The inputs to

this test case include VIRS and TMI ancillary data from TSDIS, ECS products from the GSFC and EDC DAACs, and NOAA ancillary data. The Test method is used to verify this test case.

The CERES 4aF and 4bAF processes, which were identified in the CERES Production Planning test case (Section 12.4.3.1), have the following non-CERES product dependencies: VIRS products at the GSFC DAAC (CER16T_P and CERX05), MODIS products at the GSFC DAAC (CER16A_P and CERX04A), NOAA ancillary data at the GSFC DAAC (CERX06 and CERX07)[1], and TMI product at the MSFC DAAC (CERX08).

At the scheduled times, the GSFC DAAC generates the CER16A_P and CERX04A products, which are used in CERES 4bAF processing. These MODIS products are archived[2] at the GSFC DAAC, and completion of archiving triggers the subscriptions (identified in the CERES Production Planning test case (Section 12.4.3.1)) to notify the LaRC DAAC of product availability. The LaRC DAAC receives the product availability notices from the GSFC DAAC. The LaRC DAAC sends the GSFC DAAC an ingest request specifying the platform and file locations at the LaRC DAAC for receiving the CER16A_P and CERX04A products. The GSFC DAAC pushes these products to the LaRC DAAC, which transfers them to working storage for use in CERES 4bAF processing.

The GSFC DAAC notifies the LaRC DAAC when the VIRS products (CER16T_P and CERX05) are available. The LaRC DAAC sends the GSFC DAAC an ingest request, and the GSFC DAAC pushes these products to the LaRC DAAC for use in CERES 4aF processing.

In order to obtain NOAA ancillary data for CERES 4aF and 4bAF processing, the GSFC DAAC polls designated NOAA file lists. When the GSFC DAAC identifies the required files, it initiates data transfers via FTP, to retrieve the NMC data. These data are transferred to the ECS at the GSFC DAAC, where they are archived. The completion of archiving at the GSFC DAAC triggers notifications to the LaRC DAAC that the NOAA ancillary data are available at the GSFC DAAC. The LaRC DAAC sends the GSFC DAAC an ingest request , and the GSFC DAAC pushes these data to the LaRC DAAC for use in CERES 4aF and 4bAF processing.

Similarly, the MSFC DAAC notifies the LaRC DAAC when the TMI product (CERX08) is available. The LaRC DAAC sends the MSFC DAAC an ingest request, and the MSFC DAAC pushes these products to the LaRC DAAC for use in both CERES 4aF and 4bAF processing. The LaRC DAAC updates the log with ingest information for all data and products ingested.

The expected results are that the LaRC DAAC ingests VIRS products (CER16T_P and CERX05), MODIS products (CER16A_P and CERX04A), and NOAA ancillary data (CERX06 and CERX07), which are all archived at, and received from, the GSFC DAAC; and ingests the TMI product (CERX08), which is archive at, and received from, the MSFC DAAC. Additional expected results are that the ECS ingests associated metadata, makes these data and products available for use in CERES product generation; and updates the ingest log.

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1 The immediate source of the CERX06 and CERX07 products is not certain. This test case assumes the immediate source is the GSFC DAAC (and the ultimate source is NOAA).

2 CERX04A (MODIS Cloud Imager Data) is not currently a direct MODIS output, and subsetting is required for CERES processing. The CERX04A product might not be archived at the GSFC DAAC, but stored temporarily for transfer to the LaRC DAAC.

12.4.3.4 Test Case B120430.040-CERES Product Generation and Archiving

The CERES Product Generation and Archiving test case verifies that the LaRC DAAC generates and archives CERES products resulting from the CERES processes identified in the CERES Production Planning test case (Section 12.4.3.1). The inputs to this test case include the LaRC DAAC daily production schedule and DPRs generated in the CERES Production Planning test case (Section 12.4.3.1), the TRMM CERES and AM-1 CERES Level 0 data ingested in the CERES Level 0 Data Ingest and Archiving test case (Section 12.4.3.2), ancillary data and products ingested in the CERES Ancillary Data Ingest and Archiving test case (Section 12.4.3.3), and QA information from the CERES SCF. The Test method is used to verify this test case.

The Production Scheduler at the LaRC DAAC activates the production schedule, and processing resources are initialized. This schedule includes the CERES products required as inputs to further CERES product generation. When the CERES Level 0 data and applicable ancillary data and products are available, DPRs for the CERES 1aA, 1bA, 1aT, 2aA, 2aT, 2bA, 2bT, 3bTA, 4aF, and 4bAF processes are validated for source, format, and parameter values. Each DPR is then queued consistent with its priority and resource requirements. When the required resources are available, the input data are staged for the applicable CERES PGEs. These PGEs are executed according to the daily production schedule.

This test case focuses on the CERES 4aF, 4bAF, and 3bTA processes and the products they generate. The CERES 4aF process generates the CER16T_P and CER11T (Single Satellite Footprint, TOA & Surface Flux, Cloud (TRMM CERES)) products as well as internal ancillary data. The CERES 4bAF process generates the CER16A_P, CER11A1 (Single Satellite Footprint, TOA & Surface Flux, Cloud (AM-1 CERES)), and CER11A2 (Single Satellite Footprint, TOA & Surface Flux, Cloud (AM-1 CERES)), products as well as internal ancillary data. Finally, the 3bTA process generates the CER03bTA (ERBE-Like Monthly Regional Averages (multi sat)), CER13bTA (ERBE-Like Monthly Geographical Averages (multi sat)), and CER14bTA (ERBE-Like Monthly Gridded Averages (multi sat)) products as well as internal ancillary data. (The contents of the CERES products are not verified since the PGEs use science software controlled by the CERES SCF, rather than by the ECS.)

Upon completion of CERES product generation, the LaRC DAAC updates the product log and sends a product generation status message to the SMC on CERES processing status. The CERES products and their associated metadata are archived at the LaRC DAAC and an entry is made into the product log indicating archival. The LaRC DAAC updates the product inventory, which contains information about CERES products, including the CERES products just generated. CERES inventory information is logged.

A subscription exists to make the new CERES products available to the CERES SCF to perform QA. Accordingly, the LaRC DAAC stages these products for SCF access and sends an e-mail message notifying the SCF of product availability. The SCF receives the e-mail message, retrieves the products, performs QA, and provides the LaRC DAAC with resulting QA information. The LaRC DAAC uses this information to complete the QA fields of the CERES product metadata. The LaRC DAAC data quality staff views this QA information.

The expected results are that the LaRC DAAC generates and archives the CER16T_P, CER11T, CER16A_P, CER11A1, CER11A2, CER03bTA, CER13bTA, and CER14bTA products and associated metadata; and creates appropriate log entries. Additional expected results include updating the product metadata with QA information received from the CERES SCF and displaying this information..

12.4.3.5 Test Case B120430.050-CERES Product Distribution

The CERES Product Distribution test case verifies that the ECS processes user requests for CERES products and distributes the products requested. In this test case, the users already knows which products and data they want to receive. The inputs to this test case include ECS tools/displays for ordering CERES products; the CER11T, CER11A1, and CER03bTA products archived in the CERES Product Generation and Archiving test case (Section 12.4.3.4); and the CERES expedited data (TRMM and AM-1) staged in the CERES Level 0 Data Ingest and Archiving test case (Section 12.4.3.2). The Demonstration method is used to verify this test case.

The ECS provides a user accessing the ECS (at the GSFC DAAC, for example) with information and displays on submitting an order for a one-time distribution of specific CER11T, CER11A1, and CER03bTA products. The user enters/modifies the parameters needed for requesting electronic distribution of these products and data to himself/herself. The user also provides his/her site address, log-on identification, and password.

The ECS checks the user's distribution inputs for validity and accepts them as valid. The ECS provides the SMC with a record of the order, which is entered into the data order history database. The GSFC DAAC passes the request to the LaRC DAAC, which retrieves the CER11T, CER11A1, and CER03bTA products and associated metadata from its archive and queues them for transfer via FTP. The ECS then logs on to the user's site address and transfers the CER11T, CER11A1, and CER03bTA products and metadata to the user via FTP. The ECS also sends an e-mail notification of product transfer completion to the user and logs off. The ECS creates log entries for these product ordering events.

When each product has been distributed to the user, the ECS sends an e-mail notification of product transfer completion to the user and logs off. The ECS creates log entries for all product ordering events.

To demonstrate user access to expedited data, a user who has been notified of expedited data availability submits a request to receive expedited data. The request is submitted within 48 hours of expedited data receipt at the LaRC DAAC. (The associated non-expedited Level 0 data have not yet been archived). The LaRC DAAC retrieves the requested data from the staging disk (for both TRMM and AM-1 CERES instruments) and sends these data to the user. The ECS creates appropriate log entries.

The expected results are that the ECS receives CERES product distribution parameters from a user; validates the distribution inputs; retrieves the CER11T, CER11A1, and CER03bTA products and associated metadata from the ECS archive; provides the user with these products

and associated metadata; provides notified users with access to expedited data; and creates appropriate log entries.

12.4.3.6 Test Case B120430.060-CERES Product Reprocessing and Archiving

The CERES Product Reprocessing and Archiving test case verifies that the LaRC DAAC reprocesses and archives CERES products, including the CER11T, CER11A1, and CER11A2 products. The reprocessing is necessitated by the simulated integration of new CERES science software at the LaRC DAAC for the CERES 4aF and 4bAF PGEs. The inputs to this test case include reprocessing information provided by the CERES SCFs; the LaRC DAAC processing schedule that covers CERES 4aF and 4bAF reprocessing; and the CER09T, CER16T_P, CERX05, CERX06, CERX07, CERX08, CER09A1, CER09A2, CER16A_P, and CERX04A products, and internal ancillary data used as inputs for reprocessing. The Test method is used to verify this test case.

The CERES SCF utilize a reprocessing request template previously provided by the ECS to provide the LaRC DAAC with specific information regarding regenerating the CER11T, CER11A1, and CER11A2 products. The information provided by the SCF includes a list of products to be generated, the version numbers of the science software and calibration coefficients, a list of ancillary data, and data start and stop times. NASA approves the reprocessing request, and the LaRC DAAC incorporates the reprocessing activities into its production plans.

The LaRC DAAC requests transmission, from the GSFC DAAC, of ancillary data and products, including the CER16T_P and CERX05 products needed for CERES 4aF reprocessing. Similarly, the LaRC DAAC requests that the GSFC DAAC send the CER16A_P and CERX04A products needed for CERES 4bAF reprocessing. The LaRC DAAC also requests that the MSFC DAAC send the CERX08 products needed for both CERES 4aF and 4bAF reprocessing. The CERES 4aF and 4bAF reprocessing activities are scheduled, and the LaRC DAAC sends the resulting schedules to the CERES SCF.

The LaRC DAAC ingests the ancillary data and products needed for 4aF reprocessing. The Production Scheduler at the LaRC DAAC activates the production schedule, and reprocessing resources are initialized. DPRs for the CERES 4aF process are validated for source, format, and parameter values. Each DPR is then queued consistent with its priority and resource requirements. When the required resources are available, the CER09T, CERX06, and CERX07 products, which are needed as input to 4aF reprocessing, are retrieved from the local archive. These products, as well as ingested ancillary data and products, are staged for the 4aF PGEs. These PGEs are executed according to schedule, and the CER11T product is generated. (The contents of the resulting CER11T product are not verified since the PGEs use science software controlled by the CERES SCF, rather than by the ECS.)

A similar set of events is executed for CERES 4bAF reprocessing, except that the CER09A1, CER09A2, CERX06, and CERX07 products are retrieved from the local archive and the CER11A1 and CER11A2 products are generated.

The CERES 4aF and 4bAF PGEs keep the CERES SCFs updated on the status of the reprocessing request. Upon completion of reprocessing, the LaRC DAAC updates the product log and sends a message to the SMC and CERES SCF on CERES 4aF and 4bAF reprocessing status. Successful generation of the CER11T, CER11A1, and CER11A2 products results in their archiving, and the associated metadata are stored in the applicable science data inventory. The LaRC DAAC enters ingest, reprocessing, and inventory information into the appropriate logs and notifies the CERES SCF of completion of reprocessing.

The expected results are that the ECS reprocesses and archives the CER11T, CER11A1, and CER11A2 products and associated metadata; updates the product log; provides the CERES SCF with schedules for reprocessing and notification upon completion of reprocessing.

12.4.4 MODIS Planning, Ingest, Archiving, Processing, and Distribution Sequence

The MODIS Planning, Ingest, Archiving, Processing, and Distribution Sequence verifies ECS capabilities to plan, ingest, process, archive, distribute, and reprocess MODIS data and products at the GSFC DAAC. ECS external interfaces with EDOS, EBnet, MODIS SCF, and NOAA ADC are exercised.

This sequence confirms that the GSFC DAAC ingests and archives MODIS Level 0 standard data, ancillary data and products, and associated metadata required for MODIS product generation. The capabilities of the GSFC DAAC to generate, archive, distribute, and reprocess higher-level MODIS products are confirmed.

This sequence verifies that the GSFC DAAC plans for the generation of MODIS products based on information maintained in the production planning database. The GSFC DAAC schedules the necessary executions of product generation programs in its candidate and active production plans. The GSFC DAAC coordinates with providers of ancillary data needed for MODIS product generation. The capabilities of the GSFC DAAC to ingest and archive, as appropriate, ancillary data, as well as MODIS Level 0 data received from both the SDPF via NOLAN and EDOS via EBnet, are verified.

This sequence confirms that the MODIS product generation programs are initiated using the production schedule and data availability. The ECS capability to perform scheduled processing of MODIS Level 0 standard data to higher-level products is confirmed. The capability of the GSFC DAAC to interface with the MODIS SCF to request and receive MODIS product quality information is also confirmed. The ECS provides the capability for authorized users to access MODIS standard products.

The transfer of certain MODIS products generated at the GSFC DAAC to the EDC and NSIDC DAACs is confirmed. This sequence verifies that the EDC and NSIDC DAACs ingest and archive these MODIS products. The EDC and NSIDC DAACs plan, generate, archive, and provide user access to additional MODIS products.

This sequence verifies that the ECS schedules and performs MODIS reprocessing (due to science software updates), keeps the MODIS SCF updated on reprocessing status, and archives the reprocessed products.

This sequence verifies that the ECS maintains ingest, processing, archiving, distribution, and reprocessing information on the ancillary data and generated products, as applicable. The capability to log events and transactions and update the product inventory upon archiving generated products is confirmed.

12.4.4.1 Test Case B120440.010-MODIS Production Planning

The MODIS Production Planning test case verifies that the ECS develops the plans and schedules and coordinates input data needs for generating MODIS products at the GSFC, EDC, and NSIDC DAACs. This test case focuses on planning and scheduling the production of the following six MODIS products: MOD01 (Level-1A Radiance, MODIS), MOD02 (Level-1B Radiance, Calibrated, Geolocated, MODIS), MOD09 (Surface Reflectance), MOD10 (Snow Cover), MOD33 (Gridded Snow Cover), and MOD34 (Gridded Vegetation Indices). The inputs to this test case include production requests, product thread information, and data availability predictions for specific MODIS products, as well as DAAC-specific resource profiles. The Test method is used to verify this test case.

The Production Planner at the GSFC, EDC, and NSIDC DAACs populates and maintains the production planning database at each DAAC. This database forms the basis for creating DAAC-specific production plans and schedules, which include production requests, product thread information, data availability predictions, and resource profiles.

The six MODIS products utilize other MODIS data/products, and some of them also need ancillary data and products, as inputs to product generation. However, not all input data for the six MODIS products are described herein due to the lengthy product chaining required in some cases. Only representative dependent products are included.

The production and archiving locations of the six MODIS products are depicted in Table 12-2. The MOD01 product, which is generated and archived at the GSFC DAAC, utilizes the MODIS Level 0 data and DEM as input data. The MOD01 product is used to generate the MOD02 product, in turn, which is also generated and archived at the GSFC DAAC. The MOD02 product, in turn, is used with other MODIS products, the DEM, and MIS03 (Level-1B2 Product) and MIS05 products from the LaRC DAAC to generate the MOD09 product, which is generated at the GSFC DAAC but archived at the EDC DAAC. The MOD09 product and the DEM, are used to generate the MOD34 product, which is generated and archived at the EDC DAAC. Additionally, the MOD09 product, as well as NOAA/NESDIS ancillary data and other products, are used as inputs to the MOD10 product, which is generated at the GSFC DAAC and archived at the NSIDC DAAC. The MOD10 product, in turn, is utilized with ancillary data to generate the MOD33 product, which is generated and archived at the NSIDC DAAC.

Table 12-2. Sample MODIS Products

Product	Production DAAC	Archiving DAAC
MOD01	GSFC	GSFC
MOD02	GSFC	GSFC
MOD09	GSFC	EDC
MOD10	GSFC	NSIDC
MOD33	NSIDC	NSIDC
MOD34	EDC	EDC

The ECS alerts, and coordinates with, ancillary data and product providers of the MODIS products. Specifically, the GSFC DAAC notifies NESDIS of the ancillary data needed for MOD10 product generation. The GSFC DAAC places subscriptions with the LaRC DAAC for notification when the MIS03 and MIS05 products are available. The GSFC DAAC also places a subscription with the EDC DAAC for notification when the DEM is available for use in MOD01 and MOD09 product generation. Since the MOD09 product is archived at the EDC DAAC, the EDC DAAC places a subscription with the GSFC DAAC for notification when the MOD09 product is generated. Similarly, the NSIDC DAAC places a subscription with the GSFC DAAC for notification when the MOD10 product is generated, since it is archived at the NSIDC DAAC.

The ECS provides the DAAC Production Planner with tools to create several 30-day (nominally) candidate plans updated every 2 weeks and 10-day (nominally) candidate plans updated weekly. Product generation information for the MOD01, MOD02, MOD09, and MOD10 products is integrated into these plans at the GSFC DAAC. Similarly, product generation information for the MOD33 and MOD34 products is incorporated into the NSIDC and EDC plans, respectively. The GSFC, EDC, and NSIDC DAAC plans are made available via subscription to one another, as well as to other DAACs and the SMC. The LaRC DAAC, which has access to the GSFC DAAC production plans and MODIS product dependencies, includes MIS03 and MIS05 product generation in its own production plans. Each DAAC has the capability to view the overall ECS-wide plan.

As the production target day approaches, one candidate plan at each DAAC is selected by the operations team as the active plan. This plan covers a 27-hour period and is also known as the daily production schedule. This schedule contains specific MODIS production information and is generated, reviewed, approved, and activated by the applicable DAAC Production Scheduler. Similarly, the LaRC DAAC Production Scheduler creates a daily production schedule that includes the MIS03 and MIS05 products. The daily production schedules for each DAAC are made available via subscription to one another, as well as to other DAACs and the SMC. Each DAAC has the capability to view the overall ECS-wide schedule.

At the end of MODIS production planning, the GSFC, EDC, NSIDC, and LaRC DAACs generate a DPR for each MODIS and MISR PGE scheduled for execution at the applicable

DAAC. DPR information includes PGE identification, input data granule(s), output data granule and archive location, planned start/end execution times, and priority.

The expected results include a properly maintained production planning database containing MODIS product information at the GSFC, EDC, and NSIDC DAACs; incorporating MOD01, MOD02, MOD09, MOD10, MOD33, and MOD34 product generation, as well as MIS03 and MIS05 product generation, in the production plans and schedules of the applicable DAACs; displaying these plans and schedules; and creating DPRs for the applicable MODIS and MISR PGEs. Another expected result is that the GSFC, EDC, and NSIDC DAACs alert, and coordinate with, each other and ancillary data providers, as appropriate, on the need for notification when the applicable data/products are available.

12.4.4.2 Test Case B120440.020-MODIS Level 0 Data Ingest and Archiving

The MODIS Level 0 Data Ingest and Archiving test case verifies that the GSFC DAAC ingests and archives MODIS Level 0 data and associated metadata received from EDOS. The inputs to this test case include Level 0 MODIS data and associated metadata received from EDOS as well as the procedure for purging MODIS Level 0 data from the archive. The Test method is used to verify this test case.

EDOS periodically transfers AM-1 MODIS Level 0 data and associated metadata to the GSFC DAAC. At the completion of this transfer, EDOS sends PDS delivery records, which provide information on the data just transmitted. The GSFC DAAC polls the file containing new PDS delivery records. When the new PDS delivery records are detected, the GSFC DAAC initiates data transfers via FTP to retrieve the Level 0 data from the files specified by the PDS delivery records. The Level 0 data are ingested and an ingest status is passed to EDOS.

The metadata are extracted and checked with no discrepancies found. The Level 0 data are then archived, and the metadata are stored in the applicable science data inventory. The data are staged for use in MODIS product generation. The GSFC DAAC enters ingest and inventory information into the appropriate logs.

To verify that MODIS Level 0 data are retained for one year before deletion, the GSFC DAAC system time is moved forward by 365 days (relative to the ingest date of the MODIS Level 0 data used in this test case). The procedure for purging MODIS Level 0 data from the archive is then executed. Following purge procedure completion, the MODIS Level 0 archive is checked for the presence of the data ingested earlier in this test case.

The expected results are that the GSFC DAAC ingests MODIS Level 0 data and associated metadata; archives these data for one year; makes these data available for use in MODIS product generation; and updates the appropriate logs.

12.4.4.3 Test Case B120440.030-MODIS Ancillary Data Ingest and Archiving

The MODIS Ancillary Data Ingest and Archiving test case verifies that the GSFC DAAC ingests and archives ancillary data and EOSDIS products used in generating the MODIS products identified in the MODIS Production Planning test case (Section 12.4.4.1). The inputs to this test

case include ancillary data from NOAA/NESDIS, ECS-stored products. The Test method is used to verify this test case.

The MOD01, MOD02, MOD09, MOD10, MOD33, and MOD34 products, which were identified in the MODIS Production Planning test case (Section 12.4.4.1), have the following non-MODIS product dependencies: NOAA/NESDIS data received at the GSFC DAAC, ECS products at the LaRC DAAC (MIS03 and MIS05), and the DEM product archived at the EDC DAAC.

In order to obtain the NESDIS ancillary data, the GSFC DAAC polls a designated NESDIS file list that is included in a product availability list previously provided by NESDIS. When the GSFC DAAC identifies the required files, it initiates data transfers via FTP to retrieve the NESDIS ancillary data. The GSFC DAAC accesses these data, archives them, and stages them for use in MOD10 product generation.

At the scheduled times, the LaRC DAAC generates the MIS03 and MIS05 products, which are used in MOD09 product generation. The MISR products are archived at the LaRC DAAC, and completion of archiving triggers the subscriptions (identified in the MODIS Production Planning test case (Section 12.4.4.1)) to notify the GSFC DAAC of product availability. The GSFC DAAC receives the product availability notices from the LaRC DAAC. The GSFC DAAC sends the LaRC DAAC an ingest request specifying the platform and file locations at the GSFC DAAC for receiving the MIS03 and MIS05 products. The LaRC DAAC pushes these products to the GSFC DAAC, which transfers them to working storage for use in MOD09 product generation.

The EDC DAAC notifies the GSFC DAAC when the DEM product is available. The GSFC DAAC receives the product availability notice from the EDC DAAC. The GSFC DAAC sends the EDC DAAC an ingest request specifying the platform and file location at the GSFC DAAC for receiving the DEM product. The EDC DAAC pushes this products to the GSFC DAAC, which transfers it to working storage for use in MODIS product generation. Throughout this test case, the GSFC DAAC enters ingest information into the appropriate logs.

The expected results are that the ECS ingests and archives, as necessary, NOAA/NESDIS ancillary data, ECS products, and associated metadata; makes these data and products available for use in MODIS product generation; and updates the ingest log.

12.4.4.4 Test Case B120440.040-MODIS Product Generation and Archiving at the GSFC DAAC

The MODIS Product Generation and Archiving at the GSFC DAAC test case verifies that the GSFC DAAC generates and archives MODIS products, including MODIS products identified in the MODIS Production Planning test case (Section 12.4.4.1). The inputs to this test case include the GSFC DAAC daily production schedule and DPRs generated in the MODIS Production Planning test case (Section 12.4.4.1), the MODIS Level 0 data ingested in the MODIS Level 0 Data Ingest and Archiving test case (Section 12.4.4.2), ancillary data and products ingested in the MODIS Ancillary Data Ingest and Archiving test case (Section 12.4.4.3), and QA information from the MODIS SCF. The Test method is used to verify this test case.

The Production Scheduler at the GSFC DAAC activates the production schedule, and processing resources are initialized. This schedule includes the MODIS products required as inputs to

further MODIS product generation. When the MODIS Level 0 data and applicable ancillary data and products are available, DPRs for the MOD01, MOD02, MOD09, and MOD10 products are validated for source, format, and parameter values. Each DPR is then queued consistent with its priority and resource requirements. When the required resources are available, the input data are staged for the applicable MODIS PGEs. These PGEs are executed according to the daily production schedule. (The contents of the MODIS products are not verified since the PGEs use science software controlled by the MODIS SCF, rather than by the ECS.)

Upon completion of MOD01, MOD02, MOD09, and MOD10 product generation, the GSFC DAAC updates the product log and sends a product generation status message to the SMC on MODIS processing status. The MOD01 and MOD02 products and their associated metadata are archived at the GSFC DAAC and entries are made into the product log indicating archival. The GSFC DAAC updates the product inventory, which contains information about MODIS products, including the MODIS products just generated. MODIS inventory information is logged. The MOD09 and MOD10 products are temporarily stored at the GSFC DAAC for further product generation there. However, these two products are archived at the EDC and NSIDC DAACs, respectively. (This latter capability is verified in the MODIS Product Generation and Archiving at the EDC DAAC test case (Section 12.4.4.5) and the MODIS Product Generation and Archiving at the NSIDC DAAC test case (Section 12.4.4.6).)

The successful generation of the MOD09 product triggers a subscription for notifying the EDC DAAC of MOD09 product availability. Similarly, the successful generation of the MOD10 product triggers a subscription for notifying the NSIDC DAAC of MOD10 product availability.

A subscription exists to make the MOD02 product available to the MODIS SCF to perform QA. Accordingly, the GSFC DAAC stages this product for SCF access and sends an e-mail message notifying the SCF of product availability. The SCF receives the e-mail message, retrieves the product, performs QA, and provides the GSFC DAAC with resulting QA information. The GSFC DAAC uses this information to complete the QA fields of the product metadata. The GSFC DAAC data quality staff views this QA information.

The expected results are that the GSFC DAAC generates the MOD01, MOD02, MOD09, and MOD10 products and associated metadata; archives the MOD01 and MOD02 products and associated metadata; and creates appropriate log entries. Additional expected results include updating the product metadata with QA information received from the MODIS SCF and displaying this information.

12.4.4.5 Test Case B120440.050-MODIS Product Generation and Archiving at the EDC DAAC

The MODIS Product Generation and Archiving at the EDC DAAC test case verifies that the EDC DAAC generates and archives MODIS products, including the applicable products identified in the MODIS Production Planning test case (Section 12.4.4.1). The inputs to this test case include the EDC DAAC daily production schedule and DPRs generated in the MODIS Production Planning test case (Section 12.4.4.1), the MOD09 product generated in the MODIS Product Generation and Archiving at the GSFC DAAC test case (Section 12.4.4.4), the MOD13

product generated by the GSFC DAAC and required for MOD34 product generation, the DEM, and a QA information from the MODIS SCF. The Test method is used to verify this test case.

The EDC DAAC is notified by the GSFC DAAC that the MOD09 product is available The EDC DAAC sends the GSFC DAAC an ingest request specifying the platform and file location at the EDC DAAC for receiving the MOD09 product. The GSFC DAAC pushes this product to the EDC DAAC, which transfers it to working storage. The metadata are extracted and checked with no discrepancies found. The MOD09 product is then archived, and the metadata are stored in the applicable science data inventory. The EDC DAAC enters ingest and inventory information into the appropriate logs.

The Production Scheduler at the EDC DAAC activates the EDC DAAC production schedule generated in the MODIS Production Planning test case (Section 12.4.4.1), and processing resources are initialized. This schedule includes MOD34 product generation, which needs the DEM, MOD09, and MOD13 products for input data. The MOD13 product, like the MOD09 product, is generated at the GSFC DAAC but archived at the EDC DAAC. When the DEM, MOD09, and MOD13 products are available for product generation, DPRs for the MOD34 product are validated for source, format, and parameter values. Each DPR is then queued consistent with its priority and resource requirements. When the required resources are available, the input data are staged for the MOD34 PGEs. These PGEs are executed according to the daily production schedule. (The contents of the MOD34 product are not verified since the PGEs use science software controlled by the MODIS SCF, rather than by the ECS.)

Upon completion of MOD34 product generation, the EDC DAAC updates the product log and sends a product generation status message to the SMC on MODIS processing status. The MOD34 product and its associated metadata are archived at the EDC DAAC and entries are made into the product log indicating archival. The EDC DAAC updates the product inventory, which contains information about MODIS products, including the MOD34 product just generated. MODIS inventory information is logged.

A subscription exists to make the MOD34 product available to the MODIS SCF to perform QA. Accordingly, the EDC DAAC stages this product for SCF access and sends an e-mail message notifying the SCF of product availability. The SCF receives the e-mail message, retrieves the product, performs QA, and provides the EDC DAAC with resulting QA information. The EDC DAAC uses this information to complete the QA fields of the product metadata. The EDC DAAC data quality staff views this QA information.

The expected results are that the EDC DAAC archives the MOD09 product and associated metadata; generates and archives the MOD34 product and associated metadata; and creates appropriate log entries. Additional expected results include updating the product metadata with QA information received from the MODIS SCF and displaying this information.

12.4.4.6 Test Case B120440.060-MODIS Product Generation and Archiving at the NSIDC DAAC

The MODIS Product Generation and Archiving at the NSIDC DAAC test case verifies that the NSIDC DAAC generates and archives MODIS products, including the applicable products

identified in the MODIS Production Planning test case (Section 12.4.4.1). The inputs to this test case include the NSIDC DAAC daily production schedule and DPRs generated in the MODIS Production Planning test case (Section 12.4.4.1), the MOD10 product generated in the MODIS Product Generation and Archiving at the GSFC DAAC test case (Section 12.4.4.4), ancillary data, and QA information from the MODIS SCF. The Test method is used to verify this test case.

The NSIDC DAAC is notified by the GSFC DAAC that the MOD10 product is available The NSIDC DAAC sends the GSFC DAAC an ingest request specifying the platform and file location at the NSIDC DAAC for receiving the MOD10 product. The GSFC DAAC pushes this product to the NSIDC DAAC, which transfers it to working storage. The metadata are extracted and checked with no discrepancies found. The MOD10 product is then archived, and the metadata are stored in the applicable science data inventory. The NSIDC DAAC enters ingest and inventory information into the appropriate logs.

The Production Scheduler at the NSIDC DAAC activates the NSIDC DAAC production schedule generated in the MODIS Production Planning test case (Section 12.4.4.1), and processing resources are initialized. This schedule includes MOD33 product generation. When the MOD10 and MOD13 products and ancillary data are available, DPRs for the MOD33 product are validated for source, format, and parameter values. Each DPR is then queued consistent with its priority and resource requirements. When the required resources are available, the input data are staged for the MOD33 PGEs. These PGEs are executed according to the daily production schedule. (The contents of the MOD33 product are not verified since the PGEs use science software controlled by the MODIS SCF, rather than by the ECS.)

Upon completion of MOD33 product generation, the NSIDC DAAC updates the product log and sends a product generation status message to the SMC on MODIS processing status. The MOD33 product and its associated metadata are archived at the NSIDC DAAC and entries are made into the product log indicating archival. The NSIDC DAAC updates the product inventory, which contains information about MODIS products, including the MOD33 product just generated. MODIS inventory information is logged.

A subscription exists to make the MOD33 product available to the MODIS SCF to perform QA. Accordingly, the NSIDC DAAC stages this product for SCF access and sends an e-mail message notifying the SCF of product availability. The SCF receives the e-mail message, retrieves the product, performs QA, and provides the NSIDC DAAC with resulting QA information. The NSIDC DAAC uses this information to complete the QA fields of the product metadata. The NSIDC DAAC data quality staff views this QA information.

The expected results are that the NSIDC DAAC archives the MOD10 product and associated metadata; generates and archives the MOD33 product and associated metadata; and creates appropriate log entries. Additional expected results include updating the product metadata with QA information received from the MODIS SCF and displaying this information.

12.4.4.7 Test Case B120440.070-MODIS Product Distribution

The MODIS Product Distribution test case verifies that the ECS processes user requests for MODIS products and distributes the products requested. In this test case, the user already knows which products he/she desires to receive. The inputs to this test case include ECS tools/displays for submitting orders for MODIS products and the MOD02, MOD09, MOD10, MOD33, and MOD34 products archived in the MODIS Product Generation and Archiving at the GSFC DAAC test case (Section 12.4.4.4), the MODIS Product Generation and Archiving at the EDC DAAC test case (Section 12.4.4.5), and the MODIS Product Generation and Archiving at the NSIDC DAAC test case (Section 12.4.4.6). The Demonstration method is used to verify this test case.

The ECS provides a user accessing the ECS (at the LaRC DAAC, for example) with information and displays on submitting an order for a one-time distribution of MOD02, MOD09, MOD10, MOD33, and MOD34 products archived in the three immediately preceding test cases. The user enters/modifies the parameters needed for requesting electronic distribution of these products to himself/herself. The user also provides his/her site address, log-on identification, and password.

The ECS checks the user's distribution inputs for validity and accepts them as valid. The ECS provides the SMC with a record of the order, which is entered into the data order history database. The LaRC DAAC passes the request to the GSFC DAAC, which retrieves the MOD02 product and associated metadata from its archive and queues it for transfer via FTP. The ECS then logs on to the user's site address and transfers the MOD02 product and metadata to the user via FTP. The ECS also sends an e-mail notification of product transfer completion to the user and logs off. The ECS creates log entries for these product ordering events.

Similarly, the LaRC DAAC forwards the user request to the EDC DAAC, where the MOD09 and MOD34 products are archived. The EDC DAAC retrieves these two products and associated metadata from its archive and queues them for transfer via FTP. The ECS then logs on to the user's site address and transfers the MOD09 and MOD34 products and metadata to the user via FTP.

The LaRC DAAC also passes the user request to the NSIDC DAAC, since the MOD10 and MOD33 products are archived there. The NSIDC DAAC retrieves these two products and associated metadata from its archive and queues them for transfer via FTP. The ECS then logs on to the user's site address and transfers the MOD10 and MOD33 products and metadata to the user via FTP.

When each product has been distributed to the user, the ECS sends an e-mail notification of product transfer completion to the user and logs off. The ECS creates log entries for all product ordering events.

The expected results are that the ECS receives MODIS product distribution parameters from the user; validates the distribution inputs; retrieves the MOD09, MOD10, MOD33, and MOD34 products and associated metadata from the ECS archive containing the products; provides the user with requested products and associated metadata; and creates appropriate log entries.

12.4.4.8 Test Case B120440.080-MODIS Product Reprocessing and Archiving

The MODIS Product Reprocessing and Archiving test case verifies that the GSFC DAAC reprocesses and archives MODIS products, including the MOD09 product. The reprocessing is necessitated by the simulated integration of new MODIS science software at the GSFC DAAC for the MOD09 PGEs. The inputs to this test case include reprocessing information provided by the MODIS SCF, the GSFC DAAC processing schedule that covers MOD09 reprocessing, and the DEM, MIS03, MIS05, MOD03, and other MODIS products used as inputs for reprocessing. The Test method is used to verify this test case.

The MODIS SCF utilizes a reprocessing request template previously provided by the ECS to provide the GSFC DAAC with specific information regarding reprocessing the MOD09 product. The information provided by the SCF includes a list of products to be generated, the version numbers of the science software and calibration coefficients, a list of ancillary data, and data start and stop times. NASA approves the reprocessing request, and the GSFC DAAC incorporates the reprocessing activities into its production plans.

The GSFC DAAC requests transmission of ancillary data and products, including the DEM from the EDC DAAC and the MIS03 and MIS05 products from the LaRC DAAC, used in reprocessing the MOD09 product. The MOD09 reprocessing activity is scheduled, and the GSFC DAAC sends the resulting schedule to the MODIS SCF.

The GSFC DAAC ingests the DEM, MIS03, and MIS05 products. The Production Scheduler at the GSFC DAAC activates the production schedule, and reprocessing resources are initialized. DPRs for the MOD09 product are validated for source, format, and parameter values. Each DPR is then queued consistent with its priority and resource requirements. When the required resources are available, the MOD03 and other MODIS products that are needed for MOD09 reprocessing are retrieved from the local archive. These products, as well as the DEM, MIS03, MIS05, MOD03, and other MODIS products, are staged for the MOD09 PGEs. These PGEs are executed according to schedule. (The contents of the MOD09 product are not verified since the PGEs use science software controlled by the MODIS SCF, rather than by the ECS.)

The MOD09 PGE keeps the SCF updated on the status of the reprocessing request. Upon completion of reprocessing, the GSFC DAAC updates the product log and sends a message to the SMC and MODIS SCF on MOD09 reprocessing status. The successful generation of the MOD09 product triggers a subscription indicating its availability to the EDC DAAC. The EDC DAAC receives the notification that the reprocessed MOD09 product is available at the GSFC DAAC. The EDC DAAC ingests the MOD09 product and transfers it to working storage. The metadata are extracted and checked with no discrepancies found. The MOD09 product is then archived, and the metadata are stored in the applicable science data inventory. The EDC DAAC enters ingest, reprocessing, and inventory information into the appropriate logs. The MODIS SCF is notified upon completion of reprocessing.

The expected results are that the ECS reprocesses the MOD09 product at the GSFC DAAC; archives the MOD09 product and associated metadata at the EDC DAAC; updates the product log; and provide the MODIS SCF with the schedule for reprocessing and notification upon completion of reprocessing.

12.4.5 DAS Planning, Ingest, Archiving, Processing, and Distribution Sequence

The DAS Planning, Ingest, Archiving, Processing, and Distribution Sequence verifies ECS capabilities to plan, process, archive, and distribute DAS First-Look Analysis and Final Analysis products at the GSFC DAAC. DAS product reanalysis, support to DAO research, and ancillary data ingest and archiving, are also confirmed. ECS external interfaces with the NOAA ADC, Version 0 DAACs, and the DAO local mass storage system are exercised.

This sequence confirms that the GSFC DAAC ingests and archives ancillary data and products and associated metadata needed for DAS product generation. The capabilities of the GSFC DAAC to generate, archive, and distribute DAS products are confirmed.

This sequence verifies that the GSFC DAAC plans for the generation of DAS products based on information maintained in the production planning database. The GSFC DAAC schedules the necessary executions of product generation programs in its candidate and active production plans. The GSFC DAAC coordinates with providers of ancillary data needed for DAS product generation. The capabilities of the GSFC DAAC to ingest and archive, as appropriate, data received from NOAA/NMC, NOAA/NESDIS, other ECS DAACs, and Version 0 DAACs are verified.

This sequence confirms that the DAS First-Look Analysis and Final Analysis programs are initiated and the expected products generated. The ECS provides the capability for authorized users to access DAS standard products.

The capabilities of the GSFC DAAC to plan and schedule DAS Reanalysis jobs (due to science software updates) and to generate Reanalysis products. The DAO provides Reanalysis information to the GSFC DAAC, which schedules and performs the Reanalysis. The GSFC DAAC keeps the DAO updated on the status of the Reanalysis effort, and archives the Reanalysis products.

This sequence verifies that the GSFC DAAC provides the DAO with ancillary data and products for use in research activities. The DAO executes research jobs and stages resulting output for the ECS. The GSFC DAAC accesses and archives the output.

This sequence verifies that the ECS maintains ingest, processing, archiving, and distribution information on the ancillary data and generated products, as applicable. The capability to log events and transactions and update the product inventory upon archiving generated products is confirmed.

12.4.5.1 Test Case B120450.010-DAS Operational Production Planning

The DAS Operational Production Planning test case verifies that the ECS develops the plans and schedules and coordinates input data needs for generating DAS operational, i.e., First-Look Analysis and Final Analysis, products at the GSFC DAAC. The inputs to this test case include production requests, product thread information, and data availability predictions for DAS operational products, as well as DAAC-specific resource profiles. The Test method is used to verify this test case.

The Production Planner at the GSFC DAAC populates and maintains the production planning database. This database forms the basis for creating DAAC-specific production plans and schedules, which include production requests, product thread information, data availability predictions, and resource profiles.

The First-Look Analysis utilizes recent NOAA/NMC ancillary data, TRMM TMI products and SSM/I data from the MSFC DAAC, and Version 0 NASA Scatterometer (NSCAT) data from the JPL DAAC. (This test case assumes the NSCAT data has not yet been migrated to the ECS.) The First-Look Analysis is scheduled to run daily at a certain time.

The Final Analysis, like the First-Look Analysis, utilizes NMC, TMI, SSM/I, and NSCAT data. The Final Analysis, however, also uses data/products from AM-1 instruments, i.e., CERES, MISR, and MOPITT data/products from the LaRC DAAC, MODIS and ASTER data/products from the EDC DAAC, and MODIS products from the NSIDC and GSFC DAACs. The Final Analysis usually runs daily, but only after all the necessary AM-1 data/products are available, which might take up to several months.

The ECS alerts ancillary data and product providers of the inputs needed to generate DAS products. The NMC provides the GSFC DAAC with a list of all operationally available NMC data sets. The GSFC DAAC places subscriptions with the applicable DAACs for notification when the products needed for DAS product generation are available. Specifically, the GSFC DAAC places subscriptions with the MSFC DAAC for TMI and SSM/I data, the JPL DAAC for NSCAT data, the LaRC DAAC for CERES, MISR, and MOPITT data/products, the EDC DAAC for MODIS and ASTER data/products, and the NSIDC DAAC for MODIS data/products.

The ECS provides the DAAC Production Planner with tools to create several 30-day (nominally) candidate plans updated every 2 weeks and 10-day (nominally) candidate plans updated weekly. Product generation information for the First-Look Analysis and Final Analysis products is integrated into these plans at the GSFC DAAC. The GSFC DAAC plans are made available via subscription to other DAACs and the SMC. The DAACs that provide ancillary products for DAS product generation include the required products in their own production plans. Each DAAC has the capability to view the overall ECS-wide plan.

As the production target day approaches, one candidate plan for the GSFC DAAC is selected by the operations team as the active plan. This plan covers a 27-hour period and is also known as the daily production schedule. This schedule contains specific DAS production information and is generated, reviewed, approved, and activated by the GSFC DAAC Production Scheduler. Similarly, each DAAC providing ancillary products generates an active plan. The daily production schedules for each DAAC are made available via subscription to one another, as well as to other DAACs and the SMC. Each DAAC has the capability to view the overall ECS-wide schedule.

At the end of DAS production planning, the GSFC DAAC generates a DPR for each DAS PGE scheduled for execution. DPR information includes PGE identification, input data granule(s), output data granule and archive location, planned start/end execution times, and priority.

The expected results include a properly maintained production planning database containing DAS product information at the GSFC DAAC; incorporating First-Look Analysis and Final

Analysis product generation, as well as ancillary product generation, in the production plans and schedules of the applicable DAACs; scheduling First-Look Analysis based on time of day; scheduling Final Analysis based on data availability; displaying these plans and schedules; and creating DPRs for the applicable PGEs. Another expected result is that the GSFC DAAC alerts the MSFC, JPL, LaRC, EDC, and NSIDC DAACs of the need for notification when the applicable data/products are available.

12.4.5.2 Test Case B120450.020-DAS Ancillary Data Ingest and Archiving

The DAS Ancillary Data Ingest and Archiving test case verifies that the GSFC DAAC ingests and archives ancillary data and EOSDIS products used in generating DAS First-Look Analysis and Final Analysis products. The inputs to this test case include ancillary data from NOAA/NMC; AM-1 science data/products; TMI and SSM/I data; and Version 0 NSCAT data. The Test method is used to verify this test case.

The DAS First-Look Analysis and Final Analysis products, which were identified in the DAS Operational Production Planning test case (Section 12.4.5.1), have the following product dependencies: NOAA/NMC data; data/products archived at the MSFC DAAC (TMI and SSM/I), LaRC DAAC (CERES, MISR, and MOPITT), EDC DAAC (MODIS and ASTER), and NSIDC DAAC (MODIS); and Version 0 NSCAT data at the JPL DAAC.

In order to obtain the NMC ancillary data, the GSFC DAAC polls a designated NMC file list included in the list of operationally available data sets provided in the DAS Operational Production Planning test case (Section 12.4.5.1). When the GSFC DAAC identifies the required files, it initiates file transfers to retrieve the NMC ancillary data. The GSFC DAAC accesses these data, archives them, and stages them for use in generating the First-Look Analysis and Final Analysis products.

At the scheduled times, the MSFC DAAC retrieves and the required TMI and SSM/I products, which are used in generating DAS First-Look Analysis and Final Analysis products. The completion of archiving triggers the subscriptions (identified in the DAS Operational Production Planning test case (Section 12.4.5.1)) to notify the GSFC DAAC of product availability. The GSFC DAAC receives the product availability notices from the MSFC DAAC. The GSFC DAAC sends the MSFC DAAC ingest requests specifying the platform and file locations at the GSFC DAAC for receiving the TMI and SSM/I products. The MSFC DAAC pushes these products to the GSFC DAAC, which transfers them to working storage for use in generating the First-Look Analysis and Final Analysis products.

The LaRC DAAC generates and archives the required CERES, MISR, and MOPITT products, which are used in generating the DAS Final Analysis products. Similarly, the EDC DAAC generates and archives the required MODIS and ASTER products, and the NSIDC generates and archives the required MODIS products. The completion of archiving triggers the subscriptions (identified in the DAS Operational Production Planning test case (Section 12.4.5.1)) to notify the GSFC DAAC of product availability. The GSFC DAAC receives product availability notices from the LaRC, EDC, and NSIDC DAACs. The GSFC DAAC sends these DAACs ingest requests specifying the platform and file locations at the GSFC DAAC for receiving the CERES, MISR, MOPITT, MODIS, and ASTER products. The LaRC, EDC, and NSIDC DAACs push

these products to the GSFC DAAC, which transfers them to working storage for use in Final Analysis product generation.

The Version 0 system at the JPL DAAC sends a data availability notice to inform the ECS at the JPL DAAC of the availability and filenames of the NSCAT data. The ECS at the JPL DAAC initiates FTPs to retrieve the NSCAT data from the Version 0 system. Upon successful completion of the FTP, the ECS sends data delivery notices to the Version 0 system acknowledging successful product transfers. The products are transferred to working storage. The metadata are extracted and checked with no discrepancies found. The products are then archived, and the metadata are stored in the applicable science data inventory. This archiving triggers subscriptions (identified in the DAS Operational Production Planning test case (Section 12.4.5.1)) to notify the GSFC DAAC of product availability. The JPL DAAC pushes the NSCAT data to the locations specified by the GSFC DAAC, and the metadata are checked and stored. The GSFC DAAC updates the log with ingest information for all data and products ingested.

The expected results are that the ECS ingests and archives, as necessary, NOAA/NMC ancillary data, Version 0 data, AM-1 science data/products, and associated metadata; makes these data and products available for use in First-Look Analysis and Final Analysis product generation; and updates the ingest log.

12.4.5.3 Test Case B120450.030-DAS Operational Product Generation and Archiving

The DAS Operational Product Generation and Archiving test case verifies that the GSFC DAAC generates and archives DAS First-Look Analysis and Final Analysis products. The inputs to this test case include the GSFC DAAC daily production schedule and DPRs generated in the DAS Operational Production Planning test case (Section 12.4.5.1) and ancillary data and products ingested in the DAS Ancillary Data Ingest and Archiving test case (Section 12.4.5.2). The Test method is used to verify this test case.

The Production Scheduler at the GSFC DAAC activates the production schedule, and processing resources are initialized. When the ancillary data and products are available, DPRs for the First-Look Analysis and Final Analysis products are validated for source, format, and parameter values. Each DPR is then queued consistent with its priority and resource requirements. When the required resources are available, the input data are staged for the applicable DAS PGEs. PGEs for the First-Look Analysis are based on the time of day, while PGEs for the Final Analysis are based on the availability of necessary input data. These PGEs are executed according to the daily production schedule. (The contents of the DAS products are not verified since the PGEs use science software controlled by the DAO, rather than by the ECS.)

Upon completion of First-Look Analysis and Final Analysis product generation, the GSFC DAAC updates the product log and sends DAS product generation status messages to the SMC. These products and their associated metadata are archived at the GSFC DAAC and entries are made into the product log indicating archival. Product inventory information is logged.

The expected results are that the GSFC DAAC generates and archives the First-Look Analysis and Final Analysis products and associated metadata; and updates the product log.

12.4.5.4 Test Case B120450.040-DAS Operational Product Distribution

The DAS Operational Product Distribution test case verifies that the ECS processes user requests for DAS operational products and distributes the products requested. In this test case, a DAO user already knows which products he/she desires to receive. The inputs to this test case include ECS tools/displays for submitting orders for DAS operational products and the DAS First-Look Analysis and Final Analysis products archived in the DAS Operational Product Generation and Archiving test case (Section 12.4.5.3). The Demonstration method is used to verify this test case.

The ECS provides a DAO user at the GSFC DAAC with information and displays on submitting an order for a one-time distribution of specific First-Look Analysis and Final Analysis products. The user enters/modifies the parameters needed for requesting electronic distribution of these products to himself/herself. The user also provides his/her site address, log-on identification, and password.

The ECS checks the user's distribution inputs for validity and accepts them as valid. The ECS provides the SMC with a record of the order, which is entered into the data order history database. The GSFC DAAC retrieves the requested products and associated metadata from its archive and queues them for transfer via FTP. The ECS then logs on to the user's site address and transfers the DAS products and metadata to the user via FTP. The ECS also sends an e-mail notification of product transfer completion to the user and logs off. The ECS creates log entries for these product ordering events.

The expected results are that the ECS receives DAS product distribution parameters from the user; validates the distribution inputs; retrieves the requested products and associated metadata from the GSFC DAAC archive containing the products; provides the user with requested products and associated metadata; and creates appropriate log entries.

12.4.5.5 Test Case B120450.050-DAS Reanalysis Product Generation and Archiving

The DAS Reanalysis Product Generation and Archiving test case verifies that the GSFC DAAC generates and archives Reanalysis products upon coordination with the DAO. The Reanalysis is necessitated by the simulated integration of new DAO software at the GSFC DAAC for the First-Look Analysis and Final Analysis PGEs. Since the Reanalysis effort typically takes several months to complete, this test case focuses on the overall coordination, planning, execution, and archiving process. The inputs to this test case include Reanalysis information provided by the DAO, the GSFC DAAC processing schedules that cover Reanalysis, and ancillary data and products ingested in the DAS Ancillary Data Ingest and Archiving test case (Section 12.4.5.2). The Test method is used to verify this test case.

The ECS and DAO coordinate on the details of the DAS Reanalysis including the version numbers of the DAO software, identification of any input data not already archived by the ECS, and time period for Reanalysis. The Reanalysis effort typically spans several months.

The GSFC DAAC requests transmission of ancillary data and products needed as inputs to the Reanalysis. This includes SSM/I and TMI data/products from the MSFC DAAC; NSCAT data/products from the JPL DAAC; CERES, MISR, and MOPITT data/products from the LaRC DAAC; MODIS and ASTER data/products from the EDC DAAC; and MODIS data/products from the NSIDC DAAC. The Reanalysis activities are scheduled, such that the Reanalysis does not interfere with the higher priority First-Look Analysis and Final Analysis PGEs. The GSFC DAAC sends the resulting schedule to the DAO.

The GSFC DAAC ingests the SSM/I, TMI, NSCAT and AM-1 science data/products. The Production Scheduler at the GSFC DAAC activates the production schedule, and reprocessing resources are initialized. DPRs for the Reanalysis PGEs are validated for source, format, and parameter values. Each DPR is then queued consistent with its priority and resource requirements. When the required resources are available, the NMC data and certain MODIS data/products are retrieved from the local archive. These data/products, as well as the SSM/I, TMI, NSCAT and AM-1 science data/products, are staged for the Reanalysis PGEs. These PGEs are executed according to schedule. (The contents of the Reanalysis products are not verified since the PGEs use science software controlled by the DAO, rather than by the ECS.)

As Reanalysis products are generated, the GSFC DAAC updates the product log and sends messages to the SMC and DAO on Reanalysis status. The Reanalysis products and their associated metadata are archived at the GSFC DAAC and entries made into the product log indicating archival. The GSFC DAAC updates the product inventory, which contains information about Reanalysis products. Inventory information is logged.

The expected results are that the GSFC DAAC coordinates with the DAO on the Reanalysis effort; schedules, processes, and archives Reanalysis products and associated metadata; updates the product log; and keeps the DAO informed on the progress of the Reanalysis effort.

12.4.5.6 Test Case B120450.060-DAO Research Support

The DAO Research Support test case verifies that the GSFC DAAC provides the DAO with ancillary data and products for use in research activities and archives research output specified by the DAO. The inputs to this test case include ancillary data and products archived by the GSFC and MSFC DAACs. The Demonstration method is used to verify this test case.

In order to execute certain research jobs, a DAO scientist requests ancillary data and products that are archived at the GSFC and MSFC DAACs. The GSFC DAAC retrieves, from its own archive, the requested data and products that are available. The GSFC DAAC stages these data and products to the DAO local mass storage system. For ancillary data and products that are archived at the MSFC DAAC, the GSFC DAAC sends to the MSFC DAAC an ingest request specifying the platform and file locations at the GSFC DAAC for receiving the data and products. The MSFC DAAC pushes the ancillary data and products to the GSFC DAAC, which

stages the data and products to the DAO local mass storage system. Distribution and ingest information is logged by the MSFC and GSFC DAACs.

The DAO scientist executes research jobs and stages resulting output for archiving. The GSFC DAAC accesses the output, archives it at the GSFC DAAC, and logs appropriate information.

The expected result is that the ECS supports DAO research activities by providing ancillary data and products to the DAO, archiving research output, and logging appropriate information.

12.5 Atmospheric Chemistry, Reflectance, and Solar Radiation Scenario

The Atmospheric Chemistry, Reflectance, and Solar Radiation Scenario verifies the ECS capability to provide end-to-end science data operations in support of atmospheric chemistry, reflectance, and solar radiation data, products, and information. This scenario spans the entire range of ECS activities involved in planning, ingesting, processing, archiving, distributing, and reprocessing science data and products for AM-1 MISR and MOPITT instruments, the Flight of Opportunity ACRIM instrument, and the METEOR SAGE III instrument.

This scenario is conducted primarily at the LaRC DAAC, although the GSFC DAAC and SMC are also involved. ECS external interfaces include EDOS, the ACRIM Level 0 data source (TBD), Wallops Flight Facility (WFF), MISR, MOPITT, ACRIM, and SAGE III SCFs, and NOAA ADC.

The LaRC DAAC capabilities to plan for the generation of higher-level MISR and MOPITT products; to ingest and archive MISR and MOPITT Level 0 data received from EDOS; and to ingest and archive ancillary data needed for MISR and MOPITT product generation are confirmed. This scenario verifies that the LaRC DAAC generates, archives, distributes, and reprocesses higher-level MISR and MOPITT products.

This scenario confirms that the LaRC DAAC accomplishes the following ACRIM-related tasks: to plan for the production of higher-level ACRIM products; to ingest and archive ACRIM Level 0 data; and to generate, archive, distribute, and reprocess higher-level ACRIM products.

This scenario verifies that the LaRC DAAC also performs the following SAGE III-related tasks: to plan for the production of higher-level SAGE III products; to ingest and archive SAGE III Level 0 data; and to generate, archive, distribute, and reprocess higher-level SAGE III products.

The capabilities to update the LaRC DAAC product inventory as products are generated and reprocessed and to log significant events including data transfers are verified.

12.5.1 MISR and MOPITT Planning, Ingest, Archiving, Processing, and Distribution Sequence

The MISR and MOPITT Planning, Ingest, Archiving, Processing, and Distribution Sequence verifies ECS capabilities to plan, ingest, process, archive, distribute, and reprocess MISR and MOPITT data and products at the LaRC DAAC. ECS external interfaces with EDOS, the MISR and MOPITT SCFs, and NOAA ADC are exercised.

This sequence confirms that the LaRC DAAC ingests and archives MISR and MOPITT Level 0 standard data, ancillary data and products, and associated metadata required for MISR and MOPITT product generation. The capabilities of the LaRC DAAC to generate, archive, distribute, and reprocess higher-level MISR and MOPITT products are confirmed.

This sequence verifies that the LaRC DAAC plans for the generation of MISR and MOPITT products based on information maintained in the production planning database. The LaRC DAAC schedules the necessary executions of product generation programs in its candidate and active production plans. The LaRC DAAC coordinates with providers of ancillary data needed for MISR and MOPITT product generation. The capabilities of the LaRC DAAC to ingest and archive, as appropriate, ancillary data, as well as MISR and MOPITT Level 0 data received from EDOS, are verified.

This sequence confirms that the MISR and MOPITT product generation programs are initiated using the production schedule and data availability. The ECS capability to perform scheduled processing of MISR and MOPITT Level 0 standard data to higher-level products is confirmed. The capability of the LaRC DAAC to interface with the MISR and MOPITT SCFs to request and receive MISR and MOPITT product quality information is also confirmed. The ECS provides the capability for authorized users to access MISR and MOPITT standard products.

This sequence verifies that the LaRC DAAC schedules and performs MISR and MOPITT reprocessing (due to science software updates), keeps the MISR and MOPITT SCFs updated on reprocessing status, and archives the reprocessed products.

This sequence verifies that the ECS maintains ingest, processing, archiving, distribution, and reprocessing information on the ancillary data and generated products, as applicable. The capability to log events and transactions and update the product inventory upon archiving generated products is confirmed.

12.5.1.1 Test Case B120510.010-MISR and MOPITT Production Planning

The MISR and MOPITT Production Planning test case verifies that the ECS develops the plans and schedules and coordinates input data needs for generating MISR and MOPITT products at the LaRC DAAC. This test case focuses on planning and scheduling the production of the MIS04 (Top of Atmosphere and Cloud Product) and MOP03 (CO (Carbon Monoxide) Profiles) products. The inputs to this test case include production requests, product thread information, and data availability predictions for MIS04 and MOP03 products, as well as LaRC DAAC resource profiles. The Test method is used to verify this test case.

The Production Planner at the LaRC DAAC populates and maintains the production planning database at the LaRC DAAC. This database forms the basis for creating LaRC DAAC production plans and schedules, which include production requests, product thread information, data availability predictions, and resource profiles.

The MIS04 product, which is at Level 2 and includes 9 parameters, utilizes the following products and ancillary data as inputs: MIS03 (Level-1B2 Product), MIS10 (Ancillary Geographic Product), MOD03 (Geolocation Fields), MOD06 (Cloud Product), MOD35 (Classification Masks), DAS_SFC_DATA (DAS Surface Products), DAS_PROG_PRS

(Prognostic Pressure Data), and NOAA/NESDIS ancillary data. The MIS03 product uses the MIS02 (Level-1B1 Product) and MIS10 products. The MIS02 product utilizes the MIS01 (Level-1A Product), which, in turn, uses MISR Level 0 data as input. This test case assumes that the MIS10 product is readily available, since it is updated only annually.

The MOP03 product, which is at Level 2, utilizes the following products and ancillary data as inputs: MOP01 (Level-1B Radiance), MOD30 (Temperature and Moisture Profiles), and NOAA/NMC ancillary data. The MOP01 product, in turn, uses MOPITT Level 0 data as input.

The ECS alerts, and coordinates with, ancillary data providers of the MIS04 and MOP03 products, as applicable. The LaRC DAAC places subscriptions with the GSFC DAAC for notification when the MOD03, MOD06, MOD30, and MOD35 products, as well as the DAS products, are available. The LaRC DAAC also notifies the GSFC DAAC of the need for NESDIS and NMC ancillary data.

The ECS provides the DAAC Production Planner with tools to create several 30-day (nominally) candidate plans updated every 2 weeks and 10-day (nominally) candidate plans updated weekly. Product generation information for the MIS01, MIS02, MIS03, MIS04, MIS10, MOP01, and MOP03 products is integrated into these plans at the LaRC DAAC. The LaRC DAAC plans are made available via subscription to other DAACs and the SMC. The GSFC DAAC, which has access to the LaRC DAAC production plans and MISR and MOPITT product dependencies, includes MOD03, MOD06, MOD30, and MOD35 product generation, as well as DAS_SFC_DATA and DAS_PROG_PRS in its own production plans. Each DAAC has the capability to view the overall ECS-wide plan.

As the production target day approaches, one candidate plan at the LaRC DAAC is selected by the operations team as the active plan. This plan covers a 27-hour period and is also known as the daily production schedule. This schedule contains specific MISR and MOPITT production information and is generated, reviewed, approved, and activated by the LaRC DAAC Production Scheduler. The daily production schedule for the LaRC DAAC is made available via subscription to other DAACs and the SMC. Each DAAC has the capability to view the overall ECS-wide schedule.

At the end of MISR and MOPITT production planning, the LaRC DAAC generates a DPR for each MISR and MOPITT PGE scheduled for execution at the LaRC DAAC. DPR information includes PGE identification, input data granule(s), output data granule and archive location, planned start/end execution times, and priority.

The expected results include a properly maintained production planning database containing MISR and MOPITT product information at the LaRC DAAC; incorporating MIS01, MIS02, MIS03, MIS04, MIS10, MOP01, and MOP03 product generation in the production plans and schedules of the LaRC DAAC; displaying these plans and schedules; and creating DPRs for the applicable MISR and MOPITT PGEs. Another expected result is that the LaRC DAAC alerts ancillary data providers, as applicable, on the need for notification when the applicable data/products are available.

12.5.1.2 Test Case B120510.020-MISR and MOPITT Level 0 Data Ingest and Archiving

The MISR and MOPITT Level 0 Data Ingest and Archiving test case verifies that the LaRC DAAC ingests and archives MISR and MOPITT Level 0 data and associated metadata received from EDOS. The inputs to this test case include Level 0 MISR and MOPITT data and associated metadata received from EDOS as well as the procedure for purging MISR and MOPITT Level 0 data from the archive. The Test method is used to verify this test case.

EDOS periodically transfers AM-1 MISR and MOPITT Level 0 data and associated metadata to the LaRC DAAC. At the completion of this transfer, EDOS sends PDS delivery records, which provide information on the data just transmitted. The LaRC DAAC polls the file containing new PDS delivery records. When the new PDS delivery records are detected, the LaRC DAAC initiates data transfers via FTP to retrieve the Level 0 data from the files specified by the PDS delivery records. The Level 0 data are ingested and an ingest status is passed to EDOS.

The metadata are extracted and checked with no discrepancies found. The Level 0 data are then archived, and the metadata are stored in the applicable science data inventory. The data are staged for use in MISR and MOPITT product generation. The LaRC DAAC enters ingest and inventory information into the appropriate logs.

To verify that MISR and MOPITT Level 0 data are retained for one year before deletion, the LaRC DAAC system time is moved forward by 365 days (relative to the ingest date of the MISR and MOPITT Level 0 data used in this test case). The procedure for purging MISR and MOPITT Level 0 data from the archive is then executed. Following purge procedure completion, the MISR and MOPITT Level 0 archive is checked for the presence of the data ingested earlier in this test case.

The expected results are that the LaRC DAAC ingests and archives MISR and MOPITT Level 0 data and associated metadata, makes these data available for use in MISR and MOPITT product generation, and updates the appropriate logs.

12.5.1.3 Test Case B120510.030-MISR and MOPITT Ancillary Data Ingest and Archiving

The MISR and MOPITT Ancillary Data Ingest and Archiving test case verifies that the LaRC DAAC ingests and archives ancillary data and EOSDIS products used in generating the MISR and MOPITT products identified in the MISR and MOPITT Production Planning test case (Section 12.5.1.1). The inputs to this test case include ancillary data from NOAA/NESDIS and NOAA/NMC, and ECS products from the GSFC DAAC. The Test method is used to verify this test case.

The MIS04 product, which was identified in the MISR and MOPITT Production Planning test case (Section 12.5.1.1), has the following non-MISR product dependencies: NESDIS ancillary data received via the GSFC DAAC, and ECS products at the GSFC DAAC (MOD03, MOD06, and MOD35 products and DAS products). The MOP03 product needs NMC ancillary data received via the GSFC DAAC and the MOD30 product at the GSFC DAAC.

In order to obtain the NESDIS and NMC ancillary data, the GSFC DAAC polls designated NESDIS and NMC file lists. When the GSFC DAAC identifies the required files, it initiates data transfers via FTP to retrieve the NESDIS and NMC ancillary data. These data are transferred to the ECS at the GSFC DAAC, where they are archived. The completion of archiving at the GSFC DAAC triggers notification to the LaRC DAAC that the NESDIS and NMC ancillary data are available at the GSFC DAAC. The LaRC DAAC sends the GSFC DAAC an ingest request specifying the platform and file locations at the GSFC DAAC for receiving the NESDIS and NMC data. The GSFC DAAC pushes these data to the LaRC DAAC, which ingests the data and makes them available to MIS04 and MOP03 product generation.

At the scheduled times, the GSFC DAAC generates the MOD03, MOD06, MOD30, and MOD35 products, as well as the DAS_SFC_DATA and DAS_PROG_PRS products, which are used in MIS04 and MOP03 product generation. These MODIS and DAS products are archived at the GSFC DAAC, and completion of archiving triggers the subscriptions (identified in the MISR and MOPITT Production Planning test case (Section 12.5.1.1)) to notify the LaRC DAAC of product availability. The LaRC DAAC receives the product availability notices from the GSFC DAAC. The LaRC DAAC sends the GSFC DAAC an ingest request specifying the platform and file locations at the LaRC DAAC for receiving the MOD03, MOD06, MOD30, and MOD35 products. The GSFC DAAC pushes these products to the LaRC DAAC, which transfers them to working storage for use in MIS04 and MOP03 product generation. The LaRC DAAC updates the log with ingest information for all data and products ingested.

The expected results are that the LaRC DAAC ingests NESDIS and NMC ancillary data, ECS products, and associated metadata, which all are archived at, and received from, the GSFC DAAC; makes these data and products available for use in MISR and MOPITT product generation; and updates the ingest log.

12.5.1.4 Test Case B120510.040-MISR and MOPITT Product Generation and Archiving

The MISR and MOPITT Product Generation and Archiving test case verifies that the LaRC DAAC generates and archives MISR and MOPITT products, including MISR and MOPITT products identified in the MISR and MOPITT Production Planning test case (Section 12.5.1.1). The inputs to this test case include the LaRC DAAC daily production schedule and DPRs generated in the MISR and MOPITT Production Planning test case (Section 12.5.1.1), the MISR and MOPITT Level 0 data ingested in the MISR and MOPITT Level 0 Data Ingest and Archiving test case (Section 12.5.1.2), ancillary data and products ingested in the MISR and MOPITT Ancillary Data Ingest and Archiving test case (Section 12.5.1.3), and QA information from the MISR and MOPITT SCFs. The Test method is used to verify this test case.

The Production Scheduler at the LaRC DAAC activates the production schedule, and processing resources are initialized. This schedule includes the MISR and MOPITT products required as inputs to further MISR and MOPITT product generation. When the MISR and MOPITT Level 0 data and applicable ancillary data and products are available, DPRs for the MIS01, MIS02, MIS03, MIS04, MOP01, and MOP03 products are validated for source, format, and parameter values. Each DPR is then queued consistent with its priority and resource requirements. When

the required resources are available, the input data are staged for the applicable MISR and MOPITT PGEs. These PGEs are executed according to the daily production schedule. (The contents of the MISR and MOPITT products are not verified since the PGEs use science software controlled by the MISR and MOPITT SCFs, rather than by the ECS.). Since the quasi-static MIS10 product has already been generated, it is retrieved from the LaRC DAAC archive and staged for use in generating the MIS03 and MIS04 products.

Upon completion of MIS01, MIS02, MIS03, MIS04, MOP01, and MOP03 product generation, the LaRC DAAC updates the product log and sends a product generation status message to the SMC on MISR and MOPITT processing status. The MISR and MOPITT products and their associated metadata are archived at the LaRC DAAC and entries are made into the product log indicating archival. The LaRC DAAC updates the product inventory, which contains information about MISR and MOPITT products, including the MIS01, MIS02, MIS03, MIS04, MOP01, and MOP03 products just generated. MISR and MOPITT inventory information is logged.

A subscription exists to make the MIS04 product available to the MISR SCF to perform QA. Accordingly, the LaRC DAAC stages this product for SCF access and sends an e-mail message notifying the SCF of product availability. The SCF receives the e-mail message, retrieves the product, performs QA, and provides the LaRC DAAC with resulting QA information. The LaRC DAAC uses this information to complete the QA fields of the product metadata. The LaRC DAAC data quality staff views this QA information.

Similarly, the LaRC DAAC acts on another subscription by staging the MOP03 product and sending an e-mail message to the MOPITT SCF. The SCF retrieves the product and provides the LaRC DAAC with QA information. The LaRC DAAC updates the QA fields of the product metadata, which the data quality staff views.

The expected results are that the LaRC DAAC generates and archives the MIS01, MIS02, MIS03, MIS04, MOP01, and MOP03 products and associated metadata; and creates appropriate log entries. Additional expected results include updating the product metadata with QA information received from the MISR and MOPITT SCFs and displaying this information.

12.5.1.5 Test Case B120510.050-MISR and MOPITT Product Distribution

The MISR and MOPITT Product Distribution test case verifies that the ECS processes user requests for MISR and MOPITT products and distributes the products requested. In this test case, the user already knows which products he/she desires to receive. The inputs to this test case include ECS tools/displays for submitting orders for MISR and MOPITT products and the MIS04 and MOP03 products archived in the MISR and MOPITT Product Generation and Archiving test case (Section 12.5.1.4). The Demonstration method is used to verify this test case.

The ECS provides a user accessing the ECS (at the GSFC DAAC, for example) with information and displays on submitting an order for a one-time distribution of the MIS04 and MOP03 products archived in the MISR and MOPITT Product Generation and Archiving test case (Section 12.5.1.4). The user enters/modifies the parameters needed for “pulling” the products.

The ECS checks the user's inputs for validity and accepts them as valid. The ECS provides the SMC with a record of the order, which is entered into the data order history database.

The GSFC DAAC passes the product order to the LaRC DAAC, which retrieves the MIS04 and MOP03 products and associated metadata from LaRC DAAC archive and stages it for user access via FTP. The user is still logged in when the product becomes available, and the ECS notifies him/her interactively of product availability. The user initiates FTPs to retrieve the MIS04 and MOP03 products, receives these products and associated metadata, and acknowledges completion. The ECS then issues a message to the Data Archive Manager at the LaRC DAAC to reclaim space used for staging the MIS04 and MOP03 products. The ECS creates log entries for these "pull" product ordering events.

The expected results are that the ECS receives MISR and MOPITT product distribution parameters from the user; validates the distribution inputs; retrieves the MIS04 and MOP03 products and associated metadata from the LaRC DAAC archive; provides the user with requested products and associated metadata via the FTP "pull" method; and creates appropriate log entries.

12.5.1.6 Test Case B120510.060-MISR and MOPITT Product Reprocessing and Archiving

The MISR and MOPITT Product Reprocessing and Archiving test case verifies that the LaRC DAAC reprocesses and archives MISR and MOPITT products, including the MIS04 and MOP03 products. The reprocessing is necessitated by the simulated integration of new MISR and MOPITT science software at the LaRC DAAC for the MIS04 and MOP03 PGEs. The inputs to this test case include reprocessing information provided by the MISR and MOPITT SCFs; the LaRC DAAC processing schedule that covers MIS04 and MOP03 reprocessing; and the MOD03, MOD06, MOD30, MOD35, DAS_SFC_DATA, DAS_PROG_PRS products, other MISR and MOPITT products, and NESDIS and NMC data used as inputs for reprocessing. The Test method is used to verify this test case.

The MISR and MOPITT SCFs utilize a reprocessing request template previously provided by the ECS to provide the LaRC DAAC with specific information regarding reprocessing the MIS04 and MOP03 products. The information provided by the SCFs include a list of products to be generated, the version numbers of the science software and calibration coefficients, a list of ancillary data, and data start and stop times. NASA approves the reprocessing request, and the LaRC DAAC incorporates the reprocessing activities into its production plans.

The LaRC DAAC requests transmission, from the GSFC DAAC, of ancillary data and products, including the MOD03, MOD06, and MOD35, DAS_SFC_DATA, and DAS_PROG_PRS products and NESDIS data used in reprocessing the MIS04 products. Similarly, the LaRC DAAC requests that the GSFC DAAC transfer the MOD30 products and NMC ancillary data needed for reprocessing the MOP03 products. The MIS04 and MOP03 reprocessing activities are scheduled, and the LaRC DAAC sends the resulting schedules to the MISR and MOPITT SCFs.

The LaRC DAAC ingests the ancillary data and products needed for MIS04 reprocessing. The Production Scheduler at the LaRC DAAC activates the production schedule, and reprocessing resources are initialized. DPRs for the MIS04 products are validated for source, format, and parameter values. Each DPR is then queued consistent with its priority and resource requirements. When the required resources are available, the MIS03 and MIS10 products, which are needed as inputs for MIS04 reprocessing, are retrieved from the local archive. These products, as well as ingested ancillary data and products, are staged for the MIS04 PGEs. These PGEs are executed according to schedule. (The contents of the MIS04 products are not verified since the PGEs use science software controlled by the MISR SCF, rather than by the ECS.)

A similar set of events is executed for reprocessing the MOP03 products, except that the MOD30 product and NMC ancillary data are ingested from the GSFC DAAC, and the MOP01 product is retrieved from the local archive.

The MIS04 and MOP03 PGEs keep the MISR and MOPITT SCFs updated on the status of the reprocessing request. Upon completion of reprocessing, the LaRC DAAC updates the product log and sends a message to the SMC and MISR and MOPITT SCFs on MIS04 and MOP03 reprocessing status. Successful generation of the MIS04 and MOP03 products results in their archiving, and the associated metadata are stored in the applicable science data inventory. The LaRC DAAC enters ingest, reprocessing, and inventory information into the appropriate logs and notifies the MISR and MOPITT SCFs of completion of reprocessing.

The expected results are that the LaRC DAAC reprocesses and archives MIS04 and MOP03 products and associated metadata; updates the product log; and provides the MISR and MOPITT SCFs with schedules for reprocessing and notification upon completion of reprocessing.

12.5.2 ACRIM Planning, Ingest, Archiving, Processing, and Distribution Sequence

The ACRIM Planning, Ingest, Archiving, Processing, and Distribution Sequence verifies ECS capabilities to plan, ingest, process, archive, distribute, and reprocess ACRIM data and products at the LaRC DAAC. ECS external interfaces with the ACRIM Level 0 data source (TBD) and ACRIM SCF are exercised.

This sequence confirms that the LaRC DAAC ingests and archives ACRIM Level 0 standard data and associated metadata required for ACRIM product generation. The capabilities of the LaRC DAAC to generate, archive, distribute, and reprocess higher-level ACRIM products are confirmed.

This sequence verifies that the LaRC DAAC plans for the generation of ACRIM products based on information maintained in the production planning database. The LaRC DAAC schedules the necessary executions of product generation programs in its candidate and active production plans. The capability of the LaRC DAAC to ingest and archive ACRIM Level 0 data received from the ACRIM Level 0 data source (TBD) is verified.

This sequence confirms that the ACRIM product generation programs are initiated using the production schedule and data availability. The ECS capability to perform scheduled processing of ACRIM Level 0 standard data to higher-level products is confirmed. The capability of the

LaRC DAAC to interface with the ACRIM SCF to request and receive ACRIM product quality information is also confirmed. The ECS provides the capability for authorized users to access ACRIM standard products.

This sequence verifies that the LaRC DAAC schedules and performs ACRIM reprocessing (due to science software updates), keeps the ACRIM SCF updated on reprocessing status, and archives the reprocessed products.

This sequence verifies that the ECS maintains ingest, processing, archiving, distribution, and reprocessing information on the generated products. The capability to log events and transactions and update the product inventory upon archiving generated products is confirmed.

12.5.2.1 Test Case B120520.010-ACRIM Production Planning

The ACRIM Production Planning test case verifies that the ECS develops the plans and schedules and coordinates input data needs for generating the ACRIM product, ACR01, at the LaRC DAAC. This test focuses on planning and scheduling the production of the ACR01 product (Level 1A Product). The inputs to this test case include production requests, product thread information, and data availability predictions for the ACR01 product, as well as LaRC DAAC resource profiles. The Test method is used to verify this test case.

The Production Planner at the LaRC DAAC populates and maintains the production planning database at the LaRC DAAC. This database forms the basis for creating LaRC DAAC production plans and schedules, which include production requests, product thread information, data availability predictions, and resource profiles.

The ACR01 product is a level 1A product which requires only level 0 data. (Ancillary data is not needed to generate the ACR01 product.)

The ECS provides the DAAC Production Planner with tools to create several 30-day (nominally) candidate plans updated every 2 weeks and 10-day (nominally) candidate plans updated weekly. Product generation information for the ACR01 product is integrated into these plans at the LaRC DAAC. The LaRC DAAC plans are made available via subscription to other DAACs and the SMC. Each DAAC has the capability to view the overall ECS-wide plan.

As the production target day approaches, one candidate plan at the LaRC DAAC is selected by the operations team as the active plan. The plan covers a 27-hour period and is also known as the daily production schedule. This schedule contains specific ACRIM production information and is generated, reviewed, approved, and activated by the LaRC DAAC Production Scheduler. The daily production schedule for the LaRC DAAC is made available via subscription to other DAACs and the SMC. Each DAAC has the capability to view the overall ECS-wide schedule.

At the end of ACRIM production planning, the LaRC DAAC generates a DPR for each ACRIM PGE scheduled for execution at the LaRC DAAC. DPR information includes PGE identification, input data granule(s), output data granule and archive location, planned start/end execution times, and priority.

The expected results include a properly maintained production planning database containing ACRIM product information at the LaRC DAAC; incorporating ACR01 product generation in

the production plans and schedules of the LaRC DAAC; displaying these plans and schedules; and creating DPRs for the applicable ACRIM PGEs.

12.5.2.2 Test Case B120520.020-ACRIM Level 0 Data Ingest and Archiving

The ACRIM Level 0 Data Ingest and Archiving test case verifies that the LaRC DAAC ingests and archives ACRIM Level 0 data and associated metadata received from the ACRIM Level 0 data source (TBD). The inputs to this test case include Level 0 ACRIM data and associated metadata as well as the procedure for purging ACRIM Level 0 data from the archive. The Test method is used to verify this test case.

The Level 0 data are ingested and transferred to working storage, and an ingest status is passed to the ACRIM Level 0 data source. The metadata are extracted and checked for discrepancies. If no discrepancies are found the Level 0 data are then archived, and the metadata stored in the applicable science data inventory. The data are staged for use in ACRIM product generation. The LaRC DAAC enters ingest and inventory information into the appropriate logs.

To verify that ACRIM Level 0 data are retained for one year before deletion, the LaRC DAAC system time is moved forward by 365 days (relative to the ingest date of the ACRIM Level 0 data used in this test case). The procedure for purging ACRIM Level 0 data from the archive is then executed. Following purge procedure completion, the ACRIM Level 0 archive is checked for the presence of the data ingested earlier in this test case.

The expected results are that the LaRC DAAC ingests and archives ACRIM Level 0 data and associated metadata; makes these data available for use in ACRIM product generation; and updates the appropriate logs.

12.5.2.3 Test Case B120520.030-ACRIM Product Generation and Archiving

The ACRIM Product Generation and Archiving test case verifies that the LaRC DAAC generates and archives ACRIM products, including the ACR01 product identified in the ACRIM Production Planning test case (Section 12.5.2.1). The inputs to this test case include the LaRC DAAC daily processing schedule and DPRs generated in the ACRIM Production Planning test case (Section 12.5.2.1), the ACRIM Level 0 data ingested in the ACRIM Level 0 Data Ingest and Archiving test case (Section 12.5.2.2), and QA information from the ACRIM SCF. The Test method is used to verify this test case.

The Production Scheduler at the LaRC DAAC activates the production schedule, and processing resources are initialized. When the ACRIM Level 0 data is available, DPRs for the ACR01 product are validated for source, format, and parameter values. Each DPR is then queued consistent with its priority and resource requirements. When the required resources are available, the input data are staged for the applicable ACRIM PGEs. These PGEs are executed according to schedule. (The contents of the ACRIM products are not verified since the PGEs use science software controlled by the ACRIM SCF, rather than by the ECS.)

Upon completion of ACR01 product generation, the LaRC DAAC updates the product log and sends a product generation status message to the SMC on ACRIM processing status. The ACRIM product and its associated metadata are archived at the LaRC DAAC and entries are

made into the product log indicating archival. The LaRC DAAC updates the product inventory, which contains information about ACRIM products, including the ACR01 product just generated. ACRIM product inventory information is also logged.

A subscription exists to make the ACR01 product available to the ACRIM SCF to perform QA. Accordingly, the LaRC DAAC stages this product for SCF access and sends an e-mail message notifying the SCF of product availability. The SCF receives the e-mail message, retrieves the product, performs QA, and provides the LaRC DAAC with resulting QA information. The LaRC DAAC uses this information to complete the QA fields of the product metadata. The LaRC DAAC data quality staff views this QA information.

The expected results are that the LaRC DAAC generates and archives the ACRIM product and associated metadata and creates appropriate log entries. Additional expected results include updating the product metadata with QA information received from the ACRIM SCF and displaying this information.

12.5.2.4 Test Case B120520.040-ACRIM Product Distribution

The ACRIM Product Distribution test case verifies that the ECS processes user requests for ACRIM products and distributes the products requested. In this test case, the user already knows which products he/she desire to receive. The inputs to this test case include ECS tools/displays for submitting orders for the ACR01 product archived in the ACRIM Product Generation and Archiving test case (Section 12.5.2.3). The Demonstration method is used to verify this test case.

The ECS provides a user accessing the ECS (at the GSFC DAAC, for example) with information and displays on submitting an order for a one-time distribution of the ACR01 product. The user enters/modifies the parameters needed for "pulling" the products. The ECS checks the user's inputs for validity and accepts them as valid. The ECS provides the SMC with a record of the order, which is entered into the data order history database.

The GSFC DAAC passes the product order to the LaRC DAAC, which retrieves the ACR01 product and associated metadata from LaRC DAAC archive and stages it for user access via FTP. The user is still logged in when the product becomes available, and the ECS notifies the user interactively of product availability. The user initiates FTPs to retrieve the ACR01 product, receives the product and associated metadata, and acknowledges completion. The ECS then issues a message to the Data Archive Manager at the LaRC DAAC to reclaim space used for staging the ACR01 product. The ECS creates log entries for these "pull" product ordering events.

The expected results are that the ECS receives ACR01 product distribution parameters from the user; validates the distribution inputs; retrieves the ACR01 product and associated metadata from the LaRC DAAC archive; provides the user with requested products and associated metadata via the FTP "pull" method; and creates appropriate log entries.

12.5.2.5 Test Case B120520.050-ACRIM Product Reprocessing and Archiving

The ACRIM Product Reprocessing and Archiving test case verifies that the LaRC DAAC reprocesses and archives the ACR01 product. The reprocessing is necessitated by the simulated integration of new ACRIM science software at the LaRC DAAC for the ACRIM PGEs. The inputs to this test case include reprocessing information provided by the ACRIM SCF, the LaRC DAAC processing schedule that covers ACR01 reprocessing, and ACRIM Level 0 data archived in the ACRIM Level 0 Data Ingest and Archiving test case (Section 12.5.2.2). The Test method is used to verify this test case.

The ACRIM SCF utilizes the reprocessing request template previously provided by the ECS to provide the LaRC DAAC with specific information regarding reprocessing the ACR01 product. The information provided by the SCF includes a list of products to be generated, the version numbers of the science software and calibration coefficients, and data start and stop times. NASA approves the reprocessing request, and the LaRC DAAC incorporates the reprocessing activities into its production plans.

The Production Scheduler at the LaRC DAAC activates the production schedule, and reprocessing resources are initialized. DPRs for the ACR01 product are validated for source, format, and parameter values. Each DPR is queued consistent with its priority and resource requirements. When the required resources are available, the ACRIM Level 0 data that are needed as input for ACR01 reprocessing are retrieved from the local archive and staged for the ACR01 PGEs. These PGEs are executed according to schedule. (The contents of the ACR01 product are not verified since the PGEs use science software controlled by the ACRIM SCF, rather than by the ECS.)

The ACR01 PGEs keep the ACRIM SCF updated on the status of the reprocessing request. Upon completion of reprocessing, the LaRC DAAC updates the product log and sends a message to the SMC and ACRIM SCF on ACR01 reprocessing status. After successful generation of the ACR01 product, the new product is archived and the associated metadata are stored in the applicable science data inventory. The LaRC DAAC enters ingest, reprocessing, and inventory information into the appropriate logs and notifies the ACRIM SCF of completion of reprocessing.

The expected results are that the LaRC DAAC reprocesses and archives the ACR01 product and associated metadata; updates the product log; and provides the ACRIM SCF with schedules for reprocessing and notification upon completion of reprocessing.

12.5.3 SAGE III Planning, Ingest, Archiving, Processing, and Distribution Sequence

The SAGE III Planning, Ingest, Archiving, Processing, and Distribution Sequence verifies ECS capabilities to plan, ingest, process, archive, distribute, and reprocess SAGE III data and products at the LaRC DAAC. ECS external interfaces with the WFF and SAGE III SCF are exercised.

This sequence confirms that the LaRC DAAC ingests and archives SAGE III Level 0 standard data and associated metadata required for SAGE III product generation. The capabilities of the

LaRC DAAC to generate, archive, distribute, and reprocess higher-level SAGE III products are confirmed.

This sequence verifies that the LaRC DAAC plans for the generation of SAGE III products based on information maintained in the production planning database. The LaRC DAAC schedules the necessary executions of product generation programs in its candidate and active production plans. The capability of the LaRC DAAC to ingest and archive SAGE III Level 0 data received from the WFF is verified.

This sequence confirms that the SAGE III product generation programs are initiated using the production schedule and data availability. The ECS capability to perform scheduled processing of SAGE III Level 0 standard data to higher-level products is confirmed. The capability of the LaRC DAAC to interface with the SAGE III SCF to request and receive SAGE III product quality information is also confirmed. The ECS provides the capability for authorized users to access SAGE III standard products.

This sequence verifies that the LaRC DAAC schedules and performs SAGE III reprocessing (due to science software updates), keeps the SAGE III SCF updated on reprocessing status, and archives the reprocessed products.

This sequence verifies that the ECS maintains ingest, processing, archiving, distribution, and reprocessing information on the generated products. The capability to log events and transactions and update the product inventory upon archiving generated products is confirmed.

12.5.3.1 Test Case B120530.010-SAGE III Production Planning

The SAGE III Production Planning test case verifies that the ECS develops the plans and schedules and coordinates input data needs for generating SAGE III products at the LaRC DAAC. This test case focuses on planning and scheduling the production of the SAG01 and SAG02 products. The inputs to this test case include production requests, product thread information, and data availability predictions for SAG01 and SAG02 products, as well as LaRC DAAC resource profiles. The Test method is used to verify this test case.

The Production Planner at the LaRC DAAC populates and maintains the production planning database at the LaRC DAAC. This database forms the basis for creating LaRC DAAC production plans and schedules, which include production requests, product thread information, data availability predictions, and resource profiles.

The SAG02 product is a Level 2 product which utilizes the SAG01 (Level 1B) product as input. The SAG01 product utilizes the SAGE Level 0 data as input.

The ECS provides the DAAC Production Planner with tools to create several 30-day (nominally) candidate plans updated every 2 weeks and 10-day (nominally) candidate plans updated weekly. Product generation information for the SAG01 and SAG02 products is integrated into these plans at the LaRC DAAC. The LaRC DAAC plans are made available via subscription to other DAACs and the SMC. Each DAAC has the capability to view the overall ECS-wide plan.

As the production target day approaches, one candidate plan at the LaRC DAAC is selected by the operations team as the active plan. This plan covers a 27-hour period and is also known as

the daily production schedule. This schedule contains specific SAGE III production information and is generated, reviewed, approved, and activated by the LaRC DAAC Production Scheduler. The daily production schedule for the LaRC DAAC is made available via subscription to other DAACs and the SMC. Each DAAC has the capability to view the overall ECS-wide schedule.

At the end of SAGE III production planning, the LaRC DAAC generates a DPR for each SAGE III PGE scheduled for execution at the LaRC DAAC. DPR information includes PGE identification, input data granule(s), output data granule and archive location, planned start/end execution times, and priority.

The expected results include a properly maintained production planning database containing SAGE III product information at the LaRC DAAC; incorporating ACR01 product generation in the production plans and schedules of the LaRC DAAC; displaying these plans and schedules; and creating DPRs for the applicable SAGE III PGEs.

12.5.3.2 Test Case B120530.020-SAGE III Level 0 Data Ingest and Archiving

The SAGE III Level 0 Data Ingest and Archiving test case verifies that the LaRC DAAC ingests and archives SAGE III Level 0 data and associated metadata received from WFF. The inputs to this test case include Level 0 SAGE III data and associated metadata received from WFF as well as the procedure for purging SAGE III Level 0 data from the archive. The Test method is used to verify this test case.

The Level 0 data are ingested and transferred to working storage, and an ingest status is passed to the WFF. The metadata are extracted and checked for discrepancies. If no discrepancies are found, the Level 0 data are then archived, and the metadata are stored in the applicable science data inventory. The data are staged for use in SAGE III product generation. The LaRC DAAC enters ingest and inventory information into the appropriate logs.

To verify that SAGE III Level 0 data are retained for at least one year before deletion, the LaRC DAAC system time is moved forward by 365 days (relative to the ingest date of the SAGE III Level 0 data used in this test case). The procedure for purging SAGE III Level 0 data from the archive is then executed. Following purge procedure completion, the SAGE III Level 0 archive is checked for the presence of the data ingested earlier in this test case.

The expected results are that the LaRC DAAC ingests and archives SAGE III Level 0 data and associated metadata; makes these data available for use in SAGE III product generation; and updates the appropriate logs.

12.5.3.3 Test Case B120530.030-SAGE III Product Generation and Archiving

The SAGE III Product Generation and Archiving test case verifies that the LaRC DAAC generates and archives SAGE III products, including SAGE III products identified in the SAGE III Production Planning test case (Section 12.5.3.1). The inputs to this test case include the LaRC DAAC daily processing schedule and DPRs generated in the SAGE III Production Planning test case (Section 12.5.3.1), the SAGE III Level 0 data ingested in the SAGE III Level 0 Data Ingest and Archiving test case (Section 12.5.3.2), and QA information from the SAGE III SCF. The Test method is used to verify this test case.

The Production Scheduler at the LaRC DAAC activates the production schedule, and processing resources are initialized. This schedule includes the SAGE III products required as inputs to further SAGE III product generation. When the SAGE III Level 0 data are available, DPRs for the SAG01 and SAG02 products are validated for source, format, and parameter values. Each DPR is then queued consistent with its priority and resource requirements. When the required resources are available, the input data are staged for the applicable SAGE III PGEs. These PGEs are executed according to schedule (The contents of the SAGE III products are not verified since the PGEs use science software controlled by the SAGE III SCF, rather than by the ECS.). Once the SAG01 product has been generated and archived, it is retrieved from the LaRC DAAC archive and staged for use in generating the SAG02 product.

Upon completion of SAG01 and SAG02 product generation, the LaRC DAAC updates the product log and sends a product generation status message to the SMC on SAGE III processing status. The SAGE III products and their associated metadata are archived at the LaRC DAAC and entries are made into the product log indicating archival. The LaRC DAAC updates the product inventory, which contains information about SAGE III products, including the SAG01 and SAG02 product just generated. SAGE III product inventory information is logged.

A subscription exists to make the SAG02 product available to the SAGE III SCF to perform QA. Accordingly, the LaRC DAAC stages this product for SCF access and sends an e-mail message notifying the SCF of product availability. The SCF receives the e-mail message, retrieves the product, performs QA, and provides the LaRC DAAC with resulting QA information. The LaRC DAAC uses this information to complete the QA fields of the product metadata. The LaRC DAAC data quality staff views this QA information.

The expected results are that the LaRC DAAC generates and archives SAG01 and SAG02 products and associated metadata and creates appropriate log entries. Additional expected results include updating the product metadata with QA information received from the SAGE III SCF and displaying this information.

12.5.3.4 Test Case B120530.040-SAGE III Product Distribution

The SAGE III Product Distribution test case verifies that the ECS processes user requests for SAGE III products and distributes the products requested. In this test case, the user already knows which products he/she desires to receive. The inputs to this test case include ECS tools/displays for submitting orders for SAGE III products and the SAG01 and SAG02 products archived in the SAGE III Product Generation and Archiving test case (Section 12.5.3.3). The Demonstration method is used to verify this test case.

The ECS provides a user accessing the ECS (at the GSFC DAAC, for example) with information and displays on submitting an order for a one-time distribution of the SAG01 and SAG02 products. The user enters/modifies the parameters needed for “pulling” the products. The ECS checks the user’s inputs for validity and accepts them as valid. The ECS provides the SMC with a record of the order, which is entered into the data order history database.

The GSFC DAAC passes the product order to the LaRC DAAC, which retrieves the SAG01 and SAG02 products and associated metadata from LaRC DAAC archive and stages them for user

access via FTP. The user is still logged in when the product becomes available, and the ECS notifies him/her interactively of product availability. The user initiates FTPs to retrieve the SAG01 and SAG02 products, receives these products and associated metadata, and acknowledges completion. The ECS then issues a message to the Data Archive Manager at the LaRC DAAC to reclaim space used for staging the SAG01 and SAG02 products. The ECS creates log entries for these "pull" product ordering events.

The expected results are that the ECS receives SAGE III product distribution parameters from the user; validates the distribution inputs; retrieves SAG01 and SAG02 products and associated metadata from the LaRC DAAC archive; provides the user with requested products and associated metadata via the FTP "pull" method; and creates appropriate log entries.

12.5.3.5 Test Case B120530.050-SAGE III Product Reprocessing and Archiving

The SAGE III Product Reprocessing and Archiving test case verifies that the LaRC DAAC reprocesses and archives SAGE III products, including the SAG02 products. The reprocessing is necessitated by the simulated integration of new SAGE III science software at the LaRC DAAC for the SAG01 and SAG02 PGEs. The inputs to this test case include reprocessing information provided by the SAGE III SCF, the LaRC DAAC processing schedule that covers SAG02 reprocessing, and the SAG01 product generated in the SAGE III Product Generation and Archiving test case (Section 12.5.3.3). The Test method is used to verify this test case.

The SAGE III SCF utilizes a reprocessing request template previously provided by the ECS to provide the LaRC DAAC with specific information regarding reprocessing the SAG02 products. The information provided by the SCF includes a list of products to be generated, the version numbers of the science software and calibration coefficients, and data start and stop times. NASA approves the reprocessing request, and the LaRC DAAC incorporates the reprocessing activities into its production plans.

The Production Scheduler at the LaRC DAAC activates the production schedule, and reprocessing resources are initialized. DPRs for the SAG02 product are validated for source, format, and parameter values. Each DPR is then queued consistent with its priority and resource requirements. When the required resources are available, the SAG01 product, which is needed as input for SAG02 reprocessing, is retrieved from the local archive and staged for the SAG02 PGEs. These PGEs are executed according to schedule, and the SAG02 product is generated. (The contents of this product is not verified since the PGEs use science software controlled by the SAGE III SCF, rather than by the ECS.)

The SAG02 PGEs keep the SAGE III SCF updated on the status of the reprocessing request. Upon completion of reprocessing, the LaRC DAAC updates the product log and sends a message to the SMC and SAGE III SCF on SAG02 reprocessing status. The reprocessed product is archived, and the associated metadata are stored in the applicable science data inventory. The LaRC DAAC enters ingest, reprocessing, and inventory information into the appropriate logs and notifies the SAGE III SCF of completion of reprocessing.

The expected results are that the LaRC DAAC reprocesses and archives the SAG02 product and associated metadata; updates the product log; and provides the SAGE III SCF with schedules for reprocessing and notification upon completion of reprocessing.

12.6 Ocean, Polar, and Land Processes Scenario

The Ocean, Polar, and Land Processes Scenario verifies the ECS capability to provide end-to-end science data operations in support of ocean, polar, and land data, products, and information. This scenario spans the entire range of ECS activities involved in planning, ingesting, processing, archiving, distributing, and reprocessing, as applicable, science data and products for the Flight of Opportunity COLOR instrument, the ADEOS II SeaWinds instrument, the RADAR ALT DFA and MR instruments, the Landsat 7 ETM+ instrument, and the ERS-1, ERS-2, JERS-1, and RADARSAT SAR missions.

This scenario is conducted primarily at the GSFC, JPL, EDC, and ASF DAACs, although the LaRC DAAC and SMC are also involved. ECS external interfaces include the COLOR, SeaWinds, DFA, and MR Level 0 data sources (TBD); COLOR, SeaWinds, DFA, and MR SCFs; NOAA ADC; non-ECS portion of the ASF DAAC; CSA; and Landsat 7 Processing System (LPS), Image Assessment System (IAS), International Ground Stations (IGSs), and Mission Operations Center (MOC).

The GSFC DAAC capabilities to plan for the generation of higher-level COLOR products and to ingest and archive COLOR Level 0 data. This scenario verifies that the GSFC DAAC generates, archives, distributes, and reprocesses higher-level COLOR products.

This scenario confirms that the JPL DAAC accomplishes the following tasks for SeaWinds, DFA, and MR science data: to plan for the production of higher-level ACRIM products; to ingest and archive SeaWinds, DFA, and MR Level 0 data; to ingest and archive ancillary data for SeaWinds and DFA; and to generate, archive, distribute, and reprocess higher-level SeaWinds, DFA, and MR products.

The ASF DAAC capabilities to ingest and archive SAR catalog information, to handle user requests for SAR product generation and access; to archive and distribute SAR products; and to interface with the CSA for SAR information and products are verified.

This scenario confirms the EDC DAAC capabilities to ingest, archive, and distribute Landsat 7 Level 0R data and to ingest and archive calibration information.

The capabilities to update the GSFC, JPL, ASF, and EDC DAAC product inventories as products are archive, generated, and reprocessed, as appropriate, and to log significant events including data transfers are verified.

12.6.1 COLOR Planning, Ingest, Archiving, Processing, and Distribution Sequence

The COLOR Planning, Ingest, Archiving, Processing, and Distribution Sequence verifies ECS capabilities to plan, ingest, process, archive, distribute, and reprocess COLOR data and products

at the GSFC DAAC. ECS external interfaces with the COLOR Level 0 data source (TBD) and COLOR SCF are exercised.

This sequence confirms that the GSFC DAAC ingests and archives COLOR Level 0 standard data and associated metadata required for COLOR product generation. The capabilities of the GSFC DAAC to generate, archive, distribute, and reprocess higher-level COLOR products are confirmed.

This sequence verifies that the GSFC DAAC plans for the generation of COLOR products based on information maintained in the production planning database. The GSFC DAAC schedules the necessary executions of product generation programs in its candidate and active production plans. The capability of the GSFC DAAC to ingest and archive COLOR Level 0 data received from the COLOR Level 0 data source (TBD) is verified.

This sequence confirms that the COLOR product generation programs are initiated using the production schedule and data availability. The ECS capability to perform scheduled processing of COLOR Level 0 standard data to higher-level products is confirmed. The capability of the GSFC DAAC to interface with the COLOR SCF to request and receive COLOR product quality information is also confirmed. The ECS provides the capability for authorized users to access COLOR standard products.

This sequence verifies that the GSFC DAAC schedules and performs COLOR reprocessing (due to science software updates), keeps the COLOR SCF updated on reprocessing status, and archives the reprocessed products.

This sequence verifies that the ECS maintains ingest, processing, archiving, distribution, and reprocessing information on the generated products. The capability to log events and transactions and update the product inventory upon archiving generated products is confirmed.

12.6.1.1 Test Case B120610.010-COLOR Production Planning

The COLOR Production Planning test case verifies that the ECS develops the plans and schedules and coordinates input data needs for generating COLOR products at the GSFC DAAC. This test case focuses on planning and scheduling the production of the COL01 and COL01 products. The inputs to this test case include production requests, product thread information, and data availability predictions for COL01 and COL02 products, as well as GSFC DAAC resource profiles. The Test method is used to verify this test case.

The Production Planner at the GSFC DAAC populates and maintains the production planning database at the GSFC DAAC. This database forms the basis for creating GSFC DAAC production plans and schedules, which include production requests, product thread information, data availability predictions, and resource profiles.

The COL02 product is a Level 2 product which utilizes the COL01 (Level 1B) product as input. The COL01 product utilizes the COLOR Level 0 data as input.

The ECS provides the DAAC Production Planner with tools to create several 30-day (nominally) candidate plans updated every 2 weeks and 10-day (nominally) candidate plans updated weekly. Product generation information for the COL01 and COL02 products is integrated into these plans

at the GSFC DAAC. The GSFC DAAC plans are made available via subscription to other DAACs and the SMC. Each DAAC has the capability to view the overall ECS-wide plan.

As the production target day approaches, one candidate plan at the GSFC DAAC is selected by the operations team as the active plan. This plan covers a 27-hour period and is also known as the daily production schedule. This schedule contains specific COLOR production information and is generated, reviewed, approved, and activated by the GSFC DAAC Production Scheduler. The daily production schedule for the GSFC DAAC is made available via subscription to other DAACs and the SMC. Each DAAC has the capability to view the overall ECS-wide schedule.

At the end of COLOR production planning, the GSFC DAAC generates a DPR for each COLOR PGE scheduled for execution at the GSFC DAAC. DPR information includes PGE identification, input data granule(s), output data granule and archive location, planned start/end execution times, and priority.

The expected results include a properly maintained production planning database containing COLOR product information at the GSFC DAAC; incorporating ACR01 product generation in the production plans and schedules of the GSFC DAAC; displaying these plans and schedules; and creating DPRs for the applicable COLOR PGEs.

12.6.1.2 Test Case B120610.020-COLOR Level 0 Data Ingest and Archiving

The COLOR Level 0 Data Ingest and Archiving test case verifies that the GSFC DAAC ingests and archives COLOR Level 0 data and associated metadata received from COLOR level 0 data source (TBD). The inputs to this test case include Level 0 COLOR data and associated metadata received from COLOR level 0 data source (TBD) as well as the procedure for purging COLOR Level 0 data from the archive. The Test method is used to verify this test case.

The Level 0 data are ingested and transferred to working storage, and an ingest status is passed to the COLOR level 0 data source (TBD). The metadata are extracted and checked for discrepancies. If no discrepancies are found, the Level 0 data are then archived, and the metadata are stored in the applicable science data inventory. The data are staged for use in COLOR product generation. The GSFC DAAC enters ingest and inventory information into the appropriate logs.

To verify that COLOR Level 0 data are retained for at least one year before deletion, the GSFC DAAC system time is moved forward by 365 days (relative to the ingest date of the COLOR Level 0 data used in this test case). The procedure for purging COLOR Level 0 data from the archive is then executed. Following purge procedure completion, the COLOR Level 0 archive is checked for the presence of the data ingested earlier in this test case.

The expected results are that the GSFC DAAC ingests and archives COLOR Level 0 data and associated metadata; makes these data available for use in COLOR product generation; and updates the appropriate logs.

12.6.1.3 Test Case B120610.030-COLOR Product Generation and Archiving

The COLOR Product Generation and Archiving test case verifies that the GSFC DAAC generates and archives COLOR products, including COLOR products identified in the COLOR Production Planning test case. The inputs to this test case include the GSFC DAAC daily production schedule and DPRs generated in the COLOR Production Planning test case (Section 12.6.1.1), the COLOR Level 0 data ingested in the COLOR Level 0 Data Ingest and Archiving test case (Section 12.6.1.2), and QA information from the COLOR SCF. The Test method is used to verify this test case.

The Production Scheduler at the GSFC DAAC activates the production schedule, and processing resources are initialized. This schedule includes the COLOR products required as inputs to further COLOR product generation. When the COLOR Level 0 data are available, DPRs for the COL01 and COL02, products are validated for source, format, and parameter values. Each DPR is then queued consistent with its priority and resource requirements. When the required resources are available, the input data are staged for the applicable COLOR PGEs. These PGEs are executed according to schedule (The contents of the COLOR products are not verified since the PGEs use science software controlled by the COLOR SCF, rather than by the ECS.). Once the COL01 product has been generated and archived, it is retrieved from the GSFC DAAC archive and staged for use in generating the COL02 product.

Upon completion of COL01 and COL02 product generation, the GSFC DAAC updates the product log and sends a product generation status message to the SMC on COLOR processing status. The COLOR products and their associated metadata are archived at the GSFC DAAC and entries are made into the product log indicating archival. The GSFC DAAC updates the product inventory, which contains information about COLOR products, including the COL01 and COL02 products just generated. COLOR product inventory information is logged.

A subscription exists to make the COL02 product available to the COLOR SCF to perform QA. Accordingly, the GSFC DAAC stages this product for SCF access and sends an e-mail message notifying the SCF of product availability. The SCF receives the e-mail message, retrieves the product, performs QA, and provides the GSFC DAAC with resulting QA information. The GSFC DAAC uses this information to complete the QA fields of the product metadata. The GSFC DAAC data quality staff views this QA information.

The expected results are that the GSFC DAAC generates and archives the COL01 and COL02 products and associated metadata and creates appropriate log entries. Additional expected results include updating the product metadata with QA information received from the COLOR SCF and displaying this information.

12.6.1.4 Test Case B120610.040-COLOR Product Distribution

The COLOR Product Distribution test case verifies that the ECS processes user requests for COLOR products and distributes the products requested. In this test case, the user already knows which products he/she desires to receive. The inputs to this test case include ECS tools/displays for submitting orders for COLOR products and the COL01 and COL02 products archived in the

COLOR Product Generation and Archiving test case (Section 12.6.1.3). The Demonstration method is used to verify this test case.

The ECS provides a user accessing the ECS (at the LaRC DAAC, for example) with information and displays on submitting an order for a one-time distribution of the COL01 and COL02 products archived in the COLOR Product Generation and Archiving test case (Section 12.6.1.3). The user enters/modifies the parameters needed for "pulling" the products. The ECS checks the user's inputs for validity and accepts them as valid. The ECS provides the SMC with a record of the order, which is entered into the data order history database.

The LaRC DAAC passes the product order to the GSFC DAAC, which retrieves the COL01 and COL02 products and associated metadata from the GSFC DAAC archive and stages it for user access via FTP. The user is still logged in when the product becomes available, and the ECS notifies him/her interactively of product availability. The user initiates FTPs to retrieve the COL02 and COL02 products, receives these products and associated metadata, and acknowledges completion. The ECS then issues a message to the Data Archive Manager at the GSFC DAAC to reclaim space used for staging the COL01 and COL02 products. The ECS creates log entries for these "pull" product ordering events.

The expected results are that the ECS receives COLOR product distribution parameters from the user; validates the distribution inputs; retrieves the COL01 and COL02 products and associated metadata from the GSFC DAAC archive; provides the user with requested products and associated metadata via the FTP "pull" method; and creates appropriate log entries.

12.6.1.5 Test Case B120610.050-COLOR Product Reprocessing and Archiving

The COLOR Product Reprocessing and Archiving test case verifies that the GSFC DAAC reprocesses and archives COLOR products, including the COL02 products. The reprocessing is necessitated by the simulated integration of new COLOR science software at the GSFC DAAC for the COL01 and COL02 PGEs. The inputs to this test case include reprocessing information provided by the COLOR SCF, the GSFC DAAC processing schedule that covers COL02 reprocessing, and the COL01 product generated in the COLOR Product Generation and Archiving test case (Section 12.6.1.3). The Test method is used to verify this test case.

The COLOR SCF utilizes a reprocessing request template previously provided by the ECS to provide the GSFC DAAC with specific information regarding reprocessing the COL02 product. The information provided by the SCF includes a list of products to be generated, the version numbers of the science software and calibration coefficients, and data start and stop times. NASA approves the reprocessing request, and the GSFC DAAC incorporates the reprocessing activities into its production plans.

The Production Scheduler at the GSFC DAAC activates the production schedule, and reprocessing resources are initialized. DPRs for the COL02 product are validated for source, format, and parameter values. Each DPR is then queued consistent with its priority and resource requirements. When the required resources are available, the COL01 product, which is needed as input for COL02 reprocessing, is retrieved from the local archive and staged for the COL02 PGEs. These PGEs are executed according to schedule. (The contents of the COL02 product are

not verified since the PGEs use science software controlled by the COLOR SCF, rather than by the ECS.)

The COL02 PGEs keep the COLOR SCF updated on the status of the reprocessing request. Upon completion of reprocessing, the GSFC DAAC updates the product log and sends a message to the SMC and COLOR SCF on COL02 reprocessing status. After successful generation of the COL02 product, the new product is archived, and the associated metadata are stored in the applicable science data inventory. The GSFC DAAC enters ingest, reprocessing, and inventory information into the appropriate logs and notifies the COLOR SCF of completion of reprocessing.

The expected results are that the GSFC DAAC reprocesses and archives the COL02 product and associated metadata; updates the product log; and provides the COLOR SCF with schedules for reprocessing and notification upon completion of reprocessing.

12.6.2 SeaWinds Planning, Ingest, Archiving, Processing, and Distribution Sequence

The SeaWinds Planning, Ingest, Archiving, Processing, and Distribution Sequence verifies ECS capabilities to plan, ingest, process, archive, distribute, and reprocess SeaWinds data and products at the JPL DAAC. ECS external interfaces with the SeaWinds Level 0 data source (TBD), Advanced Microwave Scanning Radiometer (AMSR) ancillary data source (TBD), SeaWinds SCF, and NOAA ADC are exercised.

This sequence confirms that the JPL DAAC ingests and archives SeaWinds Level 0 standard data, ancillary data and products, and associated metadata required for SeaWinds product generation. The capabilities of the JPL DAAC to generate, archive, distribute, and reprocess higher-level SeaWinds products are confirmed.

This sequence verifies that the JPL DAAC plans for the generation of SeaWinds products based on information maintained in the production planning database. The JPL DAAC schedules the necessary executions of product generation programs in its candidate and active production plans. The JPL DAAC coordinates with providers of ancillary data needed for SeaWinds product generation. The capabilities of the JPL DAAC to ingest and archive, as appropriate, ancillary data, as well as SeaWinds Level 0 data received from the SeaWinds Level 0 data source (TBD) are verified.

This sequence confirms that the SeaWinds product generation programs are initiated using the production schedule and data availability. The ECS capability to perform scheduled processing of SeaWinds Level 0 standard data to higher-level products is confirmed. The capability of the JPL DAAC to interface with the SeaWinds SCF to request and receive SeaWinds product quality information is also confirmed. The ECS provides the capability for authorized users to access SeaWinds standard products.

This sequence verifies that the JPL DAAC schedules and performs SeaWinds reprocessing (due to science software updates), keeps the SeaWinds SCF updated on reprocessing status, and archives the reprocessed products.

This sequence verifies that the ECS maintains ingest, processing, archiving, distribution, and reprocessing information on the ancillary data and generated products, as applicable. The capability to log events and transactions and update the product inventory upon archiving generated products is confirmed.

12.6.2.1 Test Case B120620.010-SeaWinds Production Planning

The SeaWinds Production Planning test case verifies that the ECS develops the plans and schedules and coordinates input data needs for generating SeaWinds products at the JPL DAAC. This test case focuses on planning and scheduling the execution of the SeaWinds SWS-L1B-L2 process (Level 2A&B Processing of Level 1B). This process has been selected since it utilizes inputs from the AMSR instrument and from NOAA ADCs. The inputs to this test case include production requests, product thread information, and data availability predictions for the SWS-L1B-L2 process, as well as JPL DAAC resource profiles. The Test method is used to verify this test case.

The Production Planner at the JPL DAAC populates and maintains the production planning database at the JPL DAAC. This database forms the basis for creating JPL DAAC production plans and schedules, which include production requests, product thread information, data availability predictions, and resource profiles.

The SWS-L1B-L2 process utilizes NOAA/NMC, NOAA/NESDIS, and several SeaWinds files as input. Specifically, this process uses ANC_NMC_SURF (NMC Global Model Temperature and Moisture Profiles, Ozone Profiles), ANC_NESDIS_SNOW/ICE (Daily Level 3 Product created at FNMOC using an algorithm supplied by NOAA/NMC), SWS-L1B (Level 1B Backscatter Power Record (Rev-based)), and SWS-AMSR-L1.rev (AMSR Lev.1 Brightness Temp (Rev Base)). The SWS-L1B file is generated by the SWS-L0-L1B process (Level 0 Processing Data to Level 1B Data), which, in turn, uses SeaWinds Level 0 and ephemeris and attitude data as input. The SWS-AMSR-L1.rev file is generated by the SWS-AMSR-L1_Rev process (Processing Level 1 AMSR to Rev. Based Level 1), which, in turn, uses the ADEOS-AMSR-L1 (ADEOS AMSR L1 Brightness Temp) file as input. This ADEOS-AMSR-L1 file is received from a source in Japan.

The ECS alerts, and coordinates with ancillary data providers of the SWS-AMSR-L1_Rev and SWS-L1B-L2 processes. The JPL DAAC notifies the GSFC DAAC of the need for NMC and NESDIS ancillary data. The JPL DAAC also coordinates with the Japanese source of the ADEOS-AMSR-L1 file.

The ECS provides the DAAC Production Planner with tools to create several 30-day (nominally) candidate plans updated every 2 weeks and 10-day (nominally) candidate plans updated weekly. Product generation information for the SeaWinds processes is integrated into these plans at the JPL DAAC. The JPL DAAC plans are made available via subscription to other DAACs and the SMC. Each DAAC has the capability to view the overall ECS-wide plan.

As the production target day approaches, one candidate plan at the JPL DAAC is selected by the operations team as the active plan. This plan covers a 27-hour period and is also known as the daily production schedule. This schedule contains specific SeaWinds production information

and is generated, reviewed, approved, and activated by the JPL DAAC Production Scheduler. The daily production schedule for the JPL DAAC is made available via subscription to other DAACs and the SMC. Each DAAC has the capability to view the overall ECS-wide schedule.

At the end of SeaWinds production planning, the JPL DAAC generates a DPR for each SeaWinds PGE scheduled for execution at the JPL DAAC. DPR information includes PGE identification, input data granule(s), output data granule and archive location, planned start/end execution times, and priority.

The expected results include a properly maintained production planning database containing SeaWinds product information at the JPL DAAC; incorporating SWS-L1B-L2, SWS-L0-L1B, and SWS-AMSR-L1_Rev processes in the production plans and schedules of the JPL DAAC; displaying these plans and schedules; and creating DPRs for the applicable SeaWinds PGEs. Another expected result is that the JPL DAAC coordinates with the ADEOS-AMSR-L1 file source and alerts the GSFC DAAC on the need for notification when the applicable data/products are available.

12.6.2.2 Test Case B120620.020-SeaWinds Level 0 Data Ingest and Archiving

The SeaWinds Level 0 Data Ingest and Archiving test case verifies that the JPL DAAC ingests and archives the SeaWinds Level 0 data and associated metadata received from the SeaWinds Level 0 data source (TBD). The inputs to this test case include SeaWinds Level 0 data and associated metadata received from the SeaWinds Level 0 data source and the procedure for purging SeaWinds Level 0 data from the archive. The Test method is used to verify this test case.

The Level 0 data are ingested and transferred to working storage, and an ingest status is passed to the SeaWinds Level 0 data source. The metadata are extracted and checked for discrepancies. If no discrepancies are found, the Level 0 data are then archived, and the metadata are stored in the applicable science data inventory. The data are staged for use in SeaWinds product generation. The JPL DAAC enters ingest and inventory information into the appropriate logs.

To verify that SeaWinds Level 0 data are retained for at least one year before deletion, the JPL DAAC system time is moved forward by 365 days (relative to the ingest date of the SeaWinds Level 0 data used in this test case). The procedure for purging SeaWinds Level 0 data from the archive is then executed. Following purge procedure completion, the SeaWinds Level 0 archive is checked for the presence of the data ingested earlier in this test case.

The expected results are that the JPL DAAC ingests and archives SeaWinds Level 0 and associated metadata; makes the Level 0 data available for use in SeaWinds product generation; and updates the appropriate logs.

12.6.2.3 Test Case B120620.030-SeaWinds Ancillary Data Ingest and Archiving

The SeaWinds Ancillary Data Ingest and Archiving test case verifies that the JPL DAAC ingests and archives, as necessary, ancillary data used in generating the SeaWinds products identified in the SeaWinds Production Planning test case (Section 12.6.2.1). The inputs to this test case

include NMC and NESDIS ancillary data from NOAA and AMSR data from Japan. The Test method is used to verify this test case.

The SeaWinds SWS-AMSR-L1_Rev process needs the ADEOS-AMSR-L1 file from Japan, and the SWS-L1B-L2 process needs NMC and NESDIS ancillary data from NOAA. Both processes were identified in the SeaWinds Production Planning test case (Section 12.6.2.1).

The ADEOS-AMSR-L1 file is ingested and transferred to working storage at the JPL DAAC, and an ingest status is passed to the AMSR file source. This file is checked for discrepancies. No discrepancies are found and the file is archived and made available for use in SWS-AMSR-L1_Rev processing.

In order to obtain the NESDIS and NMC ancillary data, the GSFC DAAC polls designated NESDIS and NMC file lists. When the GSFC DAAC identifies the required files, it initiates data transfers via FTP to retrieve the NESDIS and NMC ancillary data. These data are transferred to the ECS at the GSFC DAAC, where they are archived. The completion of archiving at the GSFC DAAC triggers notification to the JPL DAAC that the NESDIS and NMC ancillary data are available at the GSFC DAAC. The JPL DAAC sends the GSFC DAAC an ingest request specifying the platform and file locations at the GSFC DAAC for receiving the NESDIS and NMC data. The GSFC DAAC pushes these data to the JPL DAAC, which ingests the data and makes them available for use in SWS-L1B-L2 processing. The JPL DAAC updates the log with ingest information for all data and products ingested.

The expected results are that the JPL DAAC ingests and archives AMSR ancillary data and associated metadata received from Japan; ingests NMC and NESDIS ancillary data and associated metadata, which are archived at, and received from, the GSFC DAAC; makes these data and products available for use in SeaWinds product generation; and updates the appropriate logs.

12.6.2.4 Test Case B120620.040-SeaWinds Product Generation and Archiving

The SeaWinds Product Generation and Archiving test case verifies that the JPL DAAC generates and archives SeaWinds products resulting from the SeaWinds processes identified in the SeaWinds Production Planning test case (Section 12.6.2.1). The inputs to this test case include the JPL DAAC daily production schedule and DPRs generated in the SeaWinds Production Planning test case (Section 12.6.2.1), the SeaWinds Level 0 data ingested in the SeaWinds Level 0 Data Ingest and Archiving test case Section (Section 12.6.2.2), ancillary data ingested in the SeaWinds Ancillary Data Ingest and Archiving test case (Section 12.6.2.3), and QA information from the SeaWinds SCF. The Test method is used to verify this test case.

The Production Scheduler at the JPL DAAC activates the production schedule, and processing resources are initialized. This schedule includes the SeaWinds products required as inputs to further SeaWinds product generation. When the SeaWinds Level 0 data and applicable ancillary data and products are available, DPRs for the SWS-L0-L1B, SWS-AMSR-L1_Rev, and SWS-L1B-L2 processes are validated for source, format, and parameter values. Each DPR is then queued consistent with its priority and resource requirements. When the required resources are

available, the input data are staged for the applicable SeaWinds PGEs. These PGEs are executed according to the daily production schedule.

The SWS-L0-L1B process generates the SWS-L1B product (Level 1B Backscatter Power Record (Rev-based)). The SWS-AMSR-L1_Rev process generates the SWS-AMSR-L1.rev product (AMSR Lev.1 Brightness Temp (Rev Base)), which is used with the SWS-L1B product and NMC and NESDIS ancillary data as input to the SWS-L1B-L2 process. The output of this SWS-L1B-L2 process is the SWS-2A product (Level 2A Backscatter Cross-Section (Sigma 0) Global) and SWS-2B product (Level 2B Wind Vectors, Near Surface). (The contents of the SeaWinds products are not verified since the PGEs use science software controlled by the SeaWinds SCF, rather than by the ECS.)

The SWS-L1B-L2 process issues a data quality request, which the JPL DAAC forwards to the SeaWinds SCF to perform QA of the SWS-2B product. The SeaWinds SCF responds with QA information, which the JPL DAAC uses in completing the QA fields of the product metadata. The JPL DAAC data quality staff views this QA information.

Upon completion of SeaWinds product generation, the JPL DAAC updates the product log and sends a product generation status message to the SMC on SeaWinds processing status. The SeaWinds products and their associated metadata are archived at the JPL DAAC and entries are made into the product log indicating archival. The JPL DAAC updates the product inventory, which contains information about SeaWinds products, including the SeaWinds products just generated. SeaWinds product inventory information is logged.

A subscription exists to make the SeaWinds products available to the SeaWinds SCF to perform QA. Accordingly, the JPL DAAC stages these products for SCF access and sends an e-mail message notifying the SCF of product availability. The SCF receives the e-mail message, retrieves the products, performs QA, and provides the JPL DAAC with resulting QA information. The JPL DAAC uses this information to complete the QA fields of the product metadata. The JPL DAAC data quality staff views this QA information.

The expected results are that the JPL DAAC generates and archives the SWS-L1B, SWS-AMSR-L1.rev, SWS-2A, and SWS-2B products and associated metadata and creates appropriate log entries. Additional expected results include updating the product metadata with QA information received from the SeaWinds SCF and displaying this information.

12.6.2.5 Test Case B120620.050-SeaWinds Product Distribution

The SeaWinds Product Distribution test case verifies that the ECS processes user requests for SeaWinds products and distributes the products requested. In this test case, the user already knows which products he/she wants to receive. The inputs to this test case include ECS tools/displays for ordering SeaWinds products and the SWS-L1B, SWS-AMSR-L1.rev, SWS-2A, and SWS-2B products archived in the SeaWinds Product Generation and Archiving test case (Section 12.6.2.4). The Demonstration method is used to verify this test case.

The ECS provides a user accessing the ECS (at the GSFC DAAC, for example) with information and displays on submitting an order for a one-time distribution of specific SWS-L1B, SWS-AMSR-L1.rev, SWS-2A, and SWS-2B products. The user enters/modifies the parameters

needed for “pulling” the products. The ECS checks the user’s inputs for validity and accepts them as valid. The ECS provides the SMC with a record of the order, which is entered into the data order history database.

The GSFC DAAC passes the request to the JPL DAAC, which retrieves the SWS-L1B, SWS-AMSR-L1.rev, SWS-2A, and SWS-2B products and associated metadata from its archive and stages them for transfer via FTP. The user is still logged in when the product becomes available, and the ECS notifies him/her interactively of product availability. The user initiates an FTP, receives the SWS-L1B, SWS-AMSR-L1.rev, SWS-2A, and SWS-2B products and metadata, and acknowledges completion. The ECS then issues a message to the Data Archive Manager at the JPL DAAC to reclaim space used for staging the SWS-L1B, SWS-AMSR-L1.rev, SWS-2A, and SWS-2B products. The ECS creates log entries for these “pull” product ordering events.

The expected results are that the ECS receives SeaWinds product distribution parameters from a user; validates the distribution inputs; retrieves the SWS-L1B, SWS-AMSR-L1.rev, SWS-2A, and SWS-2B products and associated metadata from the ECS archive; provides the user with these products and associated metadata via the FTP “pull” method; and creates appropriate log entries.

12.6.2.6 Test Case B120620.060-SeaWinds Product Reprocessing and Archiving

The SeaWinds Product Reprocessing and Archiving test case verifies that the JPL DAAC reprocesses and archives SeaWinds products, including the SWS-2A, and SWS-2B products. The reprocessing is necessitated by the simulated integration of new SeaWinds science software at the JPL DAAC for the SWS-L1B-L2 PGEs. The inputs to this test case include reprocessing information provided by the SeaWinds SCF; the JPL DAAC processing schedule that covers SWS-L1B-L2 reprocessing; the SWS-L1B product archived in the SeaWinds Product Generation and Archiving test case (Section 12.6.2.4); and AMSR, NMC, and NESDIS ancillary data ingested in the SeaWinds Ancillary Data Ingest and Archiving test case (Section 12.6.2.3). The Test method is used to verify this test case.

The SeaWinds SCF utilizes a reprocessing request template previously provided by the ECS to provide the JPL DAAC with specific information regarding regenerating the SWS-2A, and SWS-2B products. The information provided by the SCF includes a list of products to be generated, the version numbers of the science software and calibration coefficients, a list of ancillary data, and data start and stop times. NASA approves the reprocessing request, and the JPL DAAC incorporates the reprocessing activities into its production plans.

The JPL DAAC requests transmission, from the GSFC DAAC, of the NMC and NESDIS ancillary data needed for SWS-L1B-L2 reprocessing. The SWS-L1B-L2 reprocessing activities are scheduled, and the JPL DAAC sends the resulting schedules to the SeaWinds SCF.

The JPL DAAC ingests the NMC and NESDIS ancillary data needed for SWS-L1B-L2 reprocessing. The Production Scheduler at the JPL DAAC activates the production schedule, and reprocessing resources are initialized. DPRs for the SWS-L1B-L2 process are validated for source, format, and parameter values. Each DPR is then queued consistent with its priority and resource requirements. When the required resources are available, ADEOS-AMSR-L1 ancillary

data and the SWS-L1B product, which are needed as input for SWS-L1B-L2 reprocessing, are retrieved from the local archive. These data and product, as well as the ingested NMC and NESDIS ancillary data, are staged for the SWS-L1B-L2 PGEs. These PGEs are executed according to schedule, and the SWS-2A and SWS-2B products are generated. (The contents of these products are not verified since the PGEs use science software controlled by the SeaWinds SCF, rather than by the ECS.)

The SWS-L1B-L2 PGEs keep the SeaWinds SCF updated on the status of the reprocessing request. Upon completion of reprocessing, the JPL DAAC updates the product log and sends a message to the SMC and SeaWinds SCF on SWS-L1B-L2 reprocessing status. Successful generation of the SWS-2A and SWS-2B products results in their archiving, and the associated metadata are stored in the applicable science data inventory. The JPL DAAC enters ingest, reprocessing, and inventory information into the appropriate logs and notifies the SeaWinds SCF of completion of reprocessing.

The expected results are that the JPL DAAC reprocesses and archives the SWS-2A and SWS-2B products and associated metadata; updates the product log; and provides the SeaWinds SCF with schedules for reprocessing and notification upon completion of reprocessing.

12.6.3 DFA and MR Planning, Ingest, Archiving, Processing, and Distribution Sequence

The DFA and MR Planning, Ingest, Archiving, Processing, and Distribution Sequence verifies ECS capabilities to plan, ingest, process, archive, distribute, and reprocess DFA and MR data and products at the JPL DAAC. ECS external interfaces with the DFA and MR Level 0 data source (TBD), DFA and MR SCFs, and NOAA ADC are exercised.

This sequence confirms that the JPL DAAC ingests and archives, as necessary, DFA and MR Level 0 standard data, ancillary data and products, and associated metadata required for DFA and MR product generation. The capabilities of the JPL DAAC to generate, archive, distribute, and reprocess higher-level DFA and MR products are confirmed.

This sequence verifies that the JPL DAAC plans for the generation of DFA and MR products based on information maintained in the production planning database. The JPL DAAC schedules the necessary executions of product generation programs in its candidate and active production plans. The JPL DAAC coordinates with providers of ancillary data needed for DFA and MR product generation. The capabilities of the JPL DAAC to ingest and archive, as appropriate, ancillary data, as well as DFA and MR Level 0 data received from the DFA and MR Level 0 data source (TBD) are verified.

This sequence confirms that the DFA and MR product generation programs are initiated using the production schedule and data availability. The ECS capability to perform scheduled processing of DFA and MR Level 0 standard data to higher-level products is confirmed. The capability of the JPL DAAC to interface with the DFA and MR SCFs to request and receive DFA and MR product quality information is also confirmed. The ECS provides the capability for authorized users to access DFA and MR standard products.

This sequence verifies that the JPL DAAC schedules and performs DFA and MR reprocessing (due to science software updates), keeps the DFA and MR SCFs updated on reprocessing status, and archives the reprocessed products.

This sequence verifies that the ECS maintains ingest, processing, archiving, distribution, and reprocessing information on the ancillary data and generated products, as applicable. The capability to log events and transactions and update the product inventory upon archiving generated products is confirmed.

12.6.3.1 Test Case B120630.010-DFA and MR Production Planning

The DFA and MR Production Planning test case verifies that the ECS develops the plans and schedules and coordinates input data needs for generating DFA and MR products at the JPL DAAC. This test case focuses on planning and scheduling the execution of the DFA-SDR2IGDR process (Produce DFA-Interim Geophysical Science Data Record (IGDR) Level 2a Data) and the MR-RAW2SDRCorr process (Product Corrected MR-Sensor Level1B Data). These processes have been selected since DFA-SDR2IGDR utilizes inputs from NOAA/NMC and output from the MR-RAW2SDRCorr process. The inputs to this test case include production requests, product thread information, and data availability predictions for the DFA-SDR2IGDR and MR-RAW2SDRCorr processes, as well as JPL DAAC resource profiles. The Test method is used to verify this test case.

The Production Planner at the JPL DAAC populates and maintains the production planning database at the JPL DAAC. This database forms the basis for creating JPL DAAC production plans and schedules, which include production requests, product thread information, data availability predictions, and resource profiles.

The MR-RAW2SDRCorr process utilizes the MR Level 0 data as input. The DFA-SDR2IGDR process utilizes the MR-CORR_TB file generated by the MR-RAW2SDRCorr process, several DFA files, and ANC_NMC_SURF ancillary data from NOAA/NMC. The DFA files needed as input data are generated by the DFA-TIDES process (Produce DFA05 Tides Data) and DFA-STR2SDR process (Produce DFA-SDR Level 1B Data). The DFA-STR file (Level 0 Spacecraft Telemetry Record (STR)) is used as an input to the DFA-STR2SDR process and is generated by the DFA-RAW2STR process (Produce DFA-STR Level 0 S/C Telemetry Record).

The JPL DAAC notifies the GSFC DAAC of the need for NMC ancillary data. The ECS provides the DAAC Production Planner with tools to create several 30-day (nominally) candidate plans updated every 2 weeks and 10-day (nominally) candidate plans updated weekly. Product generation information for the DFA and MR processes is integrated into these plans at the JPL DAAC. The JPL DAAC plans are made available via subscription to other DAACs and the SMC. Each DAAC has the capability to view the overall ECS-wide plan.

As the production target day approaches, one candidate plan at the JPL DAAC is selected by the operations team as the active plan. This plan covers a 27-hour period and is also known as the daily production schedule. This schedule contains specific DFA and MR production information and is generated, reviewed, approved, and activated by the JPL DAAC Production Scheduler. The daily production schedule for the JPL DAAC is made available via subscription

to other DAACs and the SMC. Each DAAC has the capability to view the overall ECS-wide schedule.

At the end of DFA and MR production planning, the JPL DAAC generates a DPR for each DFA and MR PGE scheduled for execution at the JPL DAAC. DPR information includes PGE identification, input data granule(s), output data granule and archive location, planned start/end execution times, and priority.

The expected results include a properly maintained production planning database containing DFA and MR product information at the JPL DAAC; incorporating DFA-RAW2STR, DFA-STR2SDR, DFA-TIDES, DFA-SDR2IGDR, and MR-RAW2SDRCorr processes in the production plans and schedules of the JPL DAAC; displaying these plans and schedules; and creating DPRs for the applicable DFA and MR PGEs. Another expected result is that the JPL DAAC alerts the GSFC DAAC of the need for notification when the NMC ancillary data are available.

12.6.3.2 Test Case B120630.020-DFA and MR Level 0 Data Ingest and Archiving

The DFA and MR Level 0 Data Ingest and Archiving test case verifies that the JPL DAAC ingests and archives the DFA and MR Level 0 data and associated metadata received from the DFA and MR Level 0 data source (TBD). The inputs to this test case include DFA and MR Level 0 data and associated metadata received from the DFA and MR Level 0 data source and the procedure for purging DFA and MR Level 0 data from the archive. The Test method is used to verify this test case.

The Level 0 data are ingested and transferred to working storage, and an ingest status is passed to the DFA and MR Level 0 data source. The metadata are extracted and checked for discrepancies. If no discrepancies are found, the Level 0 data are then archived, and the metadata are stored in the applicable science data inventory. The data are staged for use in DFA and MR product generation. The JPL DAAC enters ingest and inventory information into the appropriate logs.

To verify that DFA and MR Level 0 data are retained for at least one year before deletion, the JPL DAAC system time is moved forward by 365 days (relative to the ingest date of the DFA and MR Level 0 data used in this test case). The procedure for purging DFA and MR Level 0 data from the archive is then executed. Following purge procedure completion, the DFA and MR Level 0 archive is checked for the presence of the data ingested earlier in this test case.

The expected results are that the JPL DAAC ingests and archives DFA and MR Level 0 and associated metadata; makes the Level 0 data available for use in DFA and MR product generation; and updates the appropriate logs.

12.6.3.3 Test Case B120630.030-DFA Ancillary Data Ingest and Archiving

The DFA Ancillary Data Ingest and Archiving test case verifies that the ECS ingests and archives ancillary data used in generating the DFA products identified in the DFA and MR Production Planning test case (Section 12.6.3.1). The inputs to this test case include

ANC_NMC_SURF ancillary data identified in the DFA and MR Production Planning test case (Section 12.6.3.1). The Test method is used to verify this test case.

The DFA-SDR2IGDR process identified in the DFA and MR Production Planning test case (Section 12.6.3.1) needs ANC_NMC_SURF ancillary data. In order to obtain these data, the GSFC DAAC polls a designated NMC file list. When the GSFC DAAC identifies the required files, it initiates data transfers via FTP to retrieve the NMC ancillary data. These data are transferred to the ECS at the GSFC DAAC, where they are archived. The completion of archiving at the GSFC DAAC triggers notification to the JPL DAAC that the NMC ancillary data are available at the GSFC DAAC. The JPL DAAC sends the GSFC DAAC an ingest request specifying the platform and file locations at the GSFC DAAC for receiving the NMC data. The GSFC DAAC pushes these data to the JPL DAAC, which ingests the data and makes them available for use in DFA-SDR2IGDR processing. The JPL DAAC updates the log with ingest information for all data and products ingested.

The expected results are that the JPL DAAC ingests and archives NMC ancillary data and associated metadata, which are archived at, and received from, the GSFC DAAC; makes these data available for use in DFA product generation; and updates the appropriate logs.

12.6.3.4 Test Case B120630.040-DFA and MR Product Generation and Archiving

The DFA and MR Product Generation and Archiving test case verifies that the JPL DAAC generates and archives DFA and MR products resulting from the DFA and MR processes identified in the DFA and MR Production Planning test case (Section 12.6.3.1). The inputs to this test case include the JPL DAAC daily production schedule and DPRs generated in the DFA and MR Production Planning test case Section 12.6.3.1), the DFA and MR Level 0 data ingested in the DFA and MR Level 0 Data Ingest and Archiving test case Section (Section 12.6.3.2), ancillary data ingested in the DFA Ancillary Data Ingest and Archiving test case (Section 12.6.3.3), and QA information from the DFA and MR SCFs. The Test method is used to verify this test case.

The Production Scheduler at the JPL DAAC activates the production schedule, and processing resources are initialized. This schedule includes the DFA products required as inputs to further DFA product generation. When the DFA and MR Level 0 data and applicable ancillary data and products are available, DPRs for the MR-RAW2SDRCorr, DFA-RAW2STR, DFA-STR2SDR, DFA-TIDES, and DFA-SDR2IGDR processes are validated for source, format, and parameter values. Each DPR is then queued consistent with its priority and resource requirements. When the required resources are available, the input data are staged for the applicable DFA and MR PGEs. These PGEs are executed according to the daily production schedule.

The MR-RAW2SDRCorr process generates the MR-CORR_TB product (MR Corrected Brightness Temperatures). The DFA-RAW2STR process generates the DFA-STR product (DFA Raw Telemetry), which is used as an input to the DFA-STR2SDR process. The DFA-STR2SDR process, in turn, generates the DFA01 product (Level 1B Science Data Record). The DFA-TIDES process generates the DFA05 product (Level 4 Ocean Tide Model) and internal ancillary products. These ancillary products are used with the MR-CORR_TB and DFA01 products, and NMC ancillary data as input to the DFA-SDR2IGDR process. The output of this DFA-

SDR2IGDR process is the DFA02A product (DFA Level 2a IGDR Interim Geophysical Science Data Record). (The contents of the DFA and MR products are not verified since the PGEs use science software controlled by the DFA and MR SCFs, rather than by the ECS.)

Upon completion of DFA and MR product generation, the JPL DAAC updates the product log and sends a product generation status message to the SMC on DFA and MR processing status. The DFA and MR products and their associated metadata are archived at the JPL DAAC and entries are made into the product log indicating archival. The JPL DAAC updates the product inventory, which contains information about DFA and MR products, including the products just generated. DFA and MR product inventory information is logged.

A subscription exists to make the DFA02A product available to the DFA SCF to perform QA. Accordingly, the JPL DAAC stages this product for SCF access and sends an e-mail message notifying the SCF of product availability. The SCF receives the e-mail message, retrieves the product, performs QA, and provides the JPL DAAC with resulting QA information. The JPL DAAC uses this information to complete the QA fields of the product metadata. The JPL DAAC data quality staff views this QA information.

Similarly, the JPL DAAC acts on another subscription by staging the MR-CORR_TB product and sending an e-mail message to the MR SCF. The SCF retrieves the product and provides the JPL DAAC with QA information. The JPL DAAC updates the QA fields of the product metadata, which the data quality staff views.

The expected results are that the JPL DAAC generates and archives MR-CORR_TB, DFA-STR, DFA01, DFA02A, DFA05, and DFA internal ancillary products and associated metadata and creates appropriate log entries. Additional expected results include updating the product metadata with QA information received from the DFA and MR SCFs and displaying this information.

12.6.3.5 Test Case B120630.050-DFA and MR Product Distribution

The DFA and MR Product Distribution test case verifies that the ECS processes user requests for DFA and MR products and distributes the products requested. In this test case, the user already knows which products he/she wants to receive. The inputs to this test case include ECS tools/displays for ordering DFA and MR products and the MR-CORR_TB, DFA-STR, DFA01, DFA02A, and DFA05 products archived in the DFA and MR Product Generation and Archiving test case (Section 12.6.3.4). The Demonstration method is used to verify this test case.

The ECS provides a user accessing the ECS (at the GSFC DAAC, for example) with information and displays on submitting an order for a one-time distribution of specific MR-CORR_TB, DFA-STR, DFA01, DFA02A, and DFA05 products. The user enters/modifies the parameters needed for “pulling” the products. The ECS checks the user’s inputs for validity and accepts them as valid. The ECS provides the SMC with a record of the order, which is entered into the data order history database.

The GSFC DAAC passes the request to the JPL DAAC, which retrieves the MR-CORR_TB, DFA-STR, DFA01, DFA02A, and DFA05 products and associated metadata from its archive and stages them for transfer via FTP. The user is still logged in when the product becomes available,

and the ECS notifies him/her interactively of product availability. The user initiates an FTP, receives the MR-CORR_TB, DFA-STR, DFA01, DFA02A, and DFA05 products and metadata, and acknowledges completion. The ECS then issues a message to the Data Archive Manager at the JPL DAAC to reclaim space used for staging the MR-CORR_TB, DFA-STR, DFA01, DFA02A, and DFA05 products. The ECS creates log entries for these "pull" product ordering events.

The expected results are that the ECS receives DFA and MR product distribution parameters from a user; validates the distribution inputs; retrieves MR-CORR_TB, DFA-STR, DFA01, DFA02A, and DFA05 products and associated metadata from the JPL DAAC archive; provides the user with these products and associated metadata via the FTP "pull" method; and creates appropriate log entries.

12.6.3.6 Test Case B120630.060-DFA and MR Product Reprocessing and Archiving

The DFA and MR Product Reprocessing and Archiving test case verifies that the JPL DAAC reprocesses and archives DFA and MR products, including the MR-CORR_TB and DFA02A products. The reprocessing is necessitated by the simulated integration of new DFA and MR science software at the JPL DAAC for the MR-RAW2SDRCorr and DFA-SDR2IGDR PGEs. In this test case, MR reprocessing precedes DFA reprocessing so that the reprocessed MR output is used as an input to DFA reprocessing. The inputs to this test case include reprocessing information provided by the DFA and MR SCFs; the JPL DAAC processing schedule that covers MR-RAW2SDRCorr and DFA-SDR2IGDR reprocessing; MR Level 0 data ingested in the DFA and MR Level 0 Data Ingest and Archiving test case (Section 12.6.3.2); the DFA01 product and DFA internal ancillary products archived in the DFA and MR Product Generation and Archiving test case (Section 12.6.3.4); and NMC ancillary data ingested in the DFA Ancillary Data Ingest and Archiving test case (Section 12.6.3.3). The Test method is used to verify this test case.

The DFA and MR SCFs utilizes a reprocessing request template previously provided by the ECS to provide the JPL DAAC with specific information regarding regenerating the MR-CORR_TB and DFA02A products. The information provided by the SCFs includes a list of products to be generated, the version numbers of the science software and calibration coefficients, a list of ancillary data, and data start and stop times. NASA approves the reprocessing request, and the JPL DAAC incorporates the reprocessing activities into its production plans.

The JPL DAAC requests transmission, from the GSFC DAAC, of the NMC ancillary data needed for DFA-SDR2IGDR reprocessing. The MR-RAW2SDRCorr and DFA-SDR2IGDR reprocessing activities are scheduled, and the JPL DAAC sends the resulting schedules to the DFA and MR SCFs.

The Production Scheduler at the JPL DAAC activates the production schedule, and reprocessing resources are initialized. DPRs for the MR-RAW2SDRCorr process are validated for source, format, and parameter values. Each DPR is then queued consistent with its priority and resource requirements. When the required resources are available, the MR Level 0 data that are needed for MR-RAW2SDRCorr reprocessing are retrieved from the local archive and staged for the MR-RAW2SDRCorr PGEs. These PGEs are executed according to schedule, and the MR-

CORR_TB product is generated. (The contents of this product are not verified since the PGEs use science software controlled by the DFA and MR SCFs, rather than by the ECS.)

Upon completion of MR-CORR_TB product regeneration, the JPL DAAC performs DFA-SDR2IGDR reprocessing. A set of events similar to MR-RAW2SDRCorr reprocessing is executed, except that the DFA01 product, DFA internal ancillary products, and the reprocessed MR-CORR_TB product are retrieved from the local archive and used as inputs. These products, as well as NMC ancillary data ingested from the GSFC DAAC, are staged for the DFA-SDR2IGDR process, and the DFA02A product is generated.

During reprocessing, the MR-RAW2SDRCorr and DFA-SDR2IGDR PGEs keep the DFA and MR SCFs updated on the status of the reprocessing request. Upon completion of reprocessing, the JPL DAAC updates the product log and sends a message to the SMC and DFA and MR SCFs on MR-RAW2SDRCorr and DFA-SDR2IGDR reprocessing status. Successful generation of the MR-CORR_TB and DFA02A products results in their archiving, and the associated metadata are stored in the applicable science data inventory. The JPL DAAC enters ingest, reprocessing, and inventory information into the appropriate logs and notifies the DFA and MR SCFs of completion of reprocessing.

The expected results are that the JPL DAAC reprocesses and archives MR-CORR_TB and DFA02A products and associated metadata; updates the product log; and provides the DFA and MR SCFs with schedules for reprocessing and notification upon completion of reprocessing.

12.6.4 SAR Products Search, Archiving, and Access Sequence

The SAR Products Search, Archiving, and Access Sequence confirms that the ECS at the ASF DAAC has the capability to ingest and archive SAR (ERS-1, ERS-2, JERS-1, and RADARSAT) catalog information, handle user requests for SAR product generation and access, and archive SAR products. The ECS interfaces and functional capabilities necessary to allow a scientist to search, access, and view SAR products, together with associated data and management support functions, are verified.

This sequence confirms the capability of the ECS to maintain, at the ASF DAAC, a catalog of SAR raw signal data received from the non-ECS portion of the ASF DAAC. This sequence verifies that the ECS receives authorized user requests for Level 1 (low and high resolution), Level 2, and Level 3 SAR products, as well as requests for guide information. If the requested product is available in the ECS archive, ECS transmits the product to the user.

This sequence verifies the following ECS capabilities: process user requests; access catalogs and archives; pass requests to non-ECS systems; receive, archive, and send resulting output to users; and provide billing/accounting services. If an approved user requests ERS-1, JERS-1, ERS-2, and RADARSAT guide information or products not contained in the ECS archive, ECS forwards the request to the ASF DAAC production system (non-ECS) for processing. The ECS also interfaces with the CSA and the ASF DAAC production system to obtain CSA SAR products.

The ECS receives the requested output from the ASF DAAC production system (non-ECS) or the CSA, as applicable. The ECS catalogs and archives (permanently) Level 1 (low resolution), Level 2, and Level 3 products generated. For high resolution Level 1 products, however, the

ECS stores these products for 30 days. The ECS transfers the requested output to the user. Additionally, the ECS provides billing/accounting for SAR product orders.

This sequence verifies that the ECS maintains ingest, archiving, and distribution information on the catalog and products received. The capability to log events and transactions and update the product inventory upon archiving SAR products is confirmed.

12.6.4.1 Test Case B120640.010-ASF DAAC Catalog Ingest and Archiving

The ASF DAAC Catalog Ingest and Archiving test case verifies that the ECS at the ASF DAAC ingests and archives the catalog of raw signal data received from the non-ECS portion of the ASF DAAC. The inputs to this test case include the catalog of raw signal data received from the non-ECS portion of the ASF DAAC for the ERS-1, JERS-1, ERS-2**,** and RADARSAT missions. The Test method is used to verify this test case.

The non-ECS portion of the ASF DAAC provides the ECS with catalog information for ERS-1, JERS-1, ERS-2, and RADARSAT raw signal data. The ECS ingests this catalog information and transfers it to working storage, where conversion is performed, if necessary. The associated metadata are extracted and checked with no discrepancies found. The catalog information is integrated into the overall ECS SAR catalog, and the metadata are stored in the applicable science data inventory. The ECS enters ingest, inventory, and catalog information into the appropriate logs.

The expected results are that the ECS at the ASF DAAC ingests and archives ERS-1, JERS-1, ERS-2, and RADARSAT catalog information received from the non-ECS portion of the ASF DAAC and updates the appropriate logs.

12.6.4.2 Test Case B120640.020-User Query of ASF DAAC SAR Information

The User Query of ASF DAAC SAR Information test case verifies that the ECS checks access privileges for users requesting SAR information and processes requests for SAR guide information available at the non-ECS portion of the ASF DAAC. The inputs to this test case include SAR guide information (available at the non-ECS portion of the ASF DAAC) and ECS tools/displays for submitting SAR-related queries. The Demonstration method is used to verify this test case.

To verify that only authorized users can submit requests for SAR data, an unauthorized user accessing the ECS tries to submit a SAR request. The ECS compares the user's access privileges with the authorization list applicable to ASF DAAC data, detects an unauthorized user, denies access, and notifies the user that he/she cannot submit SAR requests.

Then an authorized ECS user tries to submit a SAR request. The ECS determines that the user's access privileges allow him/her to submit queries for ASF DAAC SAR data and allows the user to proceed.

The authorized user requests guide information. The ECS receives the query, reformats it as necessary, and transfers it to the non-ECS portion of the ASF DAAC, which provides the ECS

with the guide information. The ECS, in turn, provides this information to the user. The ECS creates log entries for data receipt and distribution.

The expected results are that the ECS at the ASF DAAC determines whether a user is allowed access to SAR data; transfers authorized user queries for guide information to the non-ECS portion of the ASF DAAC; forwards to the user the guide information received from the non-ECS portion of the ASF DAAC; and logs appropriate information.

12.6.4.3 Test Case B120640.030-User Access to New ASF DAAC SAR Products

The User Access to New ASF DAAC SAR Products test case verifies that the ECS processes requests for SAR products not stored within the ECS, requests generation of these products (by the non-ECS portion of the ASF DAAC), and stores and distributes products received. The inputs to this test case include ERS-1, JERS-1, ERS-2, and RADARSAT products (stored in the non-ECS portion of the ASF DAAC), a SAR catalog that contains information on the raw signal data for these products but no information on the products themselves (stored within the ECS at the ASF DAAC), and ECS tools/displays for requesting SAR products. The Demonstration method is used to verify this test case.

An authorized user initiates a query of ERS-1, JERS-1, ERS-2, and RADARSAT low resolution Level 1, high resolution Level 1, Level 2, and Level 3 products. The user enters/modifies parameters in ECS-provided tools/displays and requests electronic distribution of the ERS-1 and ERS-2 products and film distribution of the JERS-1 and RADARSAT products. The user provides his/her site address, log-on identification, and password for electronic distribution and his/her mailing address for film distribution.

The ECS at the ASF DAAC checks the user's product order and distribution inputs for validity, accepts them as valid, and provides the SMC with a record of the product order, which is entered into the data order history database. The ECS searches the SAR catalog and the 30-day temporary storage database for the requested products. However, the products are not found.

The ECS searches the SAR catalog for raw signal data corresponding to the data time of the requested products. The ECS finds a match in the raw signal data catalog for each product. Since the raw signal data are archived at the non-ECS portion of the ASF DAAC, the ECS sends it a production job request for each electronic product requested and a film generation request for each film product.

The non-ECS portion of the ASF DAAC generates the requested products (electronically for ERS-1 and ERS-2; on film for JERS-1 and RADARSAT) and provides them to the ECS. The ECS ingests the ERS-1 and ERS-2 products electronically and transfers them to working storage. The metadata are extracted and checked with no discrepancies found. The low resolution Level 1, Level 2, and Level 3 products are archived permanently, the metadata are stored in the applicable science data inventory, and a product entry is made for each product in the SAR catalog. However, the high resolution Level 1 product and its associated metadata are saved in 30-day temporary storage. The ECS queues the ERS-1 and ERS-2 products and metadata for transfer via FTP. The ECS then logs on to the user's site address and transfers these products and metadata to the user via FTP. The ECS also sends an e-mail notification of product transfer

completion to the user and logs off. The ECS enters ingest, inventory, and distribution information into the appropriate logs. The ECS generates billing/accounting information for the products provided.

For the JERS-1 and RADARSAT film products, a member of the ECS operations staff prepares the film for packaging and shipping to the user. Additionally, the ECS enters film product metadata into the appropriate database. The ECS enters ingest and distribution information into the appropriate logs and generates billing/accounting information for the products provided.

The expected results are that the ECS at the ASF DAAC receives and validates SAR product orders from an authorized user; searches the SAR catalog for requested products and corresponding raw signal data; transmits production job requests to the non-ECS portion of the ASF DAAC; ingests and archives or stores temporarily, as applicable, SAR products received electronically; prepares film products for distribution to the user; updates the SAR catalog; sends ERS-1 and ERS-2 electronic products as well as JERS-1 and RADARSAT film products to the user; and logs appropriate information.

12.6.4.4 Test Case B120640.040-User Access to Archived ASF DAAC SAR Products

The User Access to Archived ASF DAAC SAR Products test case verifies that the ECS processes requests for SAR products stored within the ECS, and distributes all products received. The inputs to this test case include the ERS-1 and ERS-2 products and associated catalog information archived in the User Access to New ASF DAAC SAR Products test case (Section 12.6.4.3), and ECS tools/displays for requesting SAR products. The Demonstration method is used to verify this test case.

An authorized user initiates a query of the ERS-1 and ERS-2 low resolution Level 1, high resolution Level 1, Level 2, and Level 3 products generated in the User Access to New ASF DAAC SAR Products test case (Section 12.6.4.3). The user enters/modifies parameters in ECS-provided tools/displays and requests electronic distribution of the ERS-1 and ERS-2 products. The user provides his/her site address, log-on identification, and password.

The ECS at the ASF DAAC checks the user's product order and distribution inputs for validity, accepts them as valid, and provides the SMC with a record of the product order, which is entered into the data order history database. The ECS searches the SAR catalog and the 30-day temporary storage database for the requested products. The products are found.

The ECS at the ASF DAAC retrieves, from its archive, the ERS-1 and ERS-2 low resolution Level 1 products, Level 2 products, and Level 3 products. The high resolution Level 1 products, however, are retrieved from 30-day temporary storage. The ECS also retrieves the associated metadata for these products and logs access information.

The ECS queues the ERS-1 and ERS-2 products and metadata for transfer via FTP. The ECS then logs on to the user's site address and transfers these products and metadata to the user via FTP. The ECS also sends an e-mail notification of product transfer completion to the user and logs off. The ECS logs distribution information and generates billing/accounting information for the products provided.

The expected results are that the ECS at the ASF DAAC receives and validates SAR product orders from an authorized user; searches the SAR catalog for requested products; retrieves ERS-1 and ERS-2 products from the ECS archive and 30-day temporary storage, as applicable; sends the requested products to the user; and logs appropriate information.

12.6.4.5 Test Case B120640.050-User Query of CSA SAR Information

The User Query of CSA SAR Information test case verifies that the ECS checks access privileges and receives user requests for SAR guide information available at the CSA. The inputs to this test case include CSA SAR guide information and ECS tools/displays for submitting SAR-related queries. The Demonstration method is used to verify this test case.

To verify that only authorized users can submit requests for SAR data, an unauthorized user accessing the ECS tries to submit a CSA SAR request. The ECS compares the user's access privileges with the authorization list applicable to CSA data, detects an unauthorized user, denies access, and notifies the user that he/she cannot submit SAR requests for CSA information.

Then an authorized ECS user tries to submit a SAR request. The ECS determines that the user's access privileges allow him/her to submit queries for CSA SAR information and allows the user to proceed.

The authorized user requests guide information. The ECS receives the query, reformats it as necessary, and transfers it to the CSA, which provides the ECS with the guide information. The ECS, in turn, provides this information to the user. The ECS creates log entries for data receipt and distribution.

The expected results are that the ECS at the ASF DAAC determines whether a user is allowed access to SAR data; transfers authorized user queries for guide information to the CSA; forwards to the user the guide information received from the CSA; and logs appropriate information.

12.6.4.6 Test Case B120640.060-User Access to CSA SAR Products

The User Access to CSA SAR Products test case verifies that the ECS receives user requests for CSA products, sends requests for raw signal data to the CSA, receives a catalog of CSA raw signal data, sends requests for CSA SAR products to the non-ECS portion of the ASF DAAC, receives resulting products, and distributes the products received. The inputs to this test case include ECS tools/displays for requesting CSA SAR products, a CSA SAR catalog, and CSA SAR products. The Demonstration method is used to verify this test case.

An authorized user initiates a query of CSA SAR higher-level products. The user enters/modifies parameters in ECS-provided tools/displays and requests electronic distribution of these products. The user provides his/her site address, log-on identification, and password for electronic distribution.

The ECS at the ASF DAAC checks the user's product order and distribution inputs for validity, accepts them as valid, and provides the SMC with a record of the product order, which is entered into the data order history database. The ECS searches the SAR database for the requested CSA SAR products. However, the products are not found.

The ECS sends the CSA a request for the raw signal data needed to generate the products requested by the user. The CSA accesses the raw signal data and sends it to the non-ECS portion of the ASF DAAC, which provides the associated raw signal data catalog information to the ECS at the ASF DAAC. The ECS ingests and archives this catalog information (as described in the ASF DAAC Catalog Ingest and Archiving test case (Section 12.6.4.1)) and sends a production job request for the requested CSA SAR products to the non-ECS portion of the ASF DAAC. The products are generated and sent to the ECS at the ASF DAAC, which archives or stores them temporarily, as applicable, and transfers them to the user via FTP (as described in the User Access to New ASF DAAC SAR Products test case (Section 12.6.4.3). The ECS enters ingest, inventory, and distribution information into the appropriate logs.

The expected results are that the ECS at the ASF DAAC receives and validates CSA SAR product orders from an authorized user; sends requests for raw signal data to the CSA; receives CSA SAR catalog information; provides the non-ECS portion of the ASF DAAC with production job requests; ingests and archives or stores temporarily, as applicable, CSA SAR products; sends these products to the user; and logs appropriate information.

12.6.5 Landsat 7 Data Ingest, Archiving, and Distribution Sequence

The Landsat 7 Data Ingest, Archiving, and Distribution Sequence verifies ECS capabilities to ingest, archive, and distribute Landsat 7 data and products at the EDC DAAC. ECS external interfaces with the Landsat 7 Processing System (LPS), Image Assessment System (IAS), International Ground Stations (IGSs), and Mission Operations Center (MOC) are exercised.

This sequence confirms that the EDC DAAC ingests and archives Landsat 7 Level 0R data and associated metadata and browse data received from the LPS. This sequence also verifies that the ECS ingests and archives calibration information and associated metadata received from the IAS as well as browse data and metadata received from Landsat 7 IGSs. The capabilities of the ECS to provide the IAS with selected Level 0R products and to provide the MOC with Landsat 7 metadata is confirmed.

Distributing Landsat 7 products, metadata, and browse data and tracking distribution status is verified. This sequence confirms that an authorized user can access Landsat 7 directory and guide information, browse data, cost estimates, Level 0R products, and calibration information.

This sequence verifies that the ECS maintains ingest, archiving, and distribution information on the data and products received. The capability to log events and transactions and update the product inventory upon archiving ingested products is confirmed.

12.6.5.1 Test Case B120650.010-LPS and IGS Data Ingest and Archiving

The LPS and IGS Data Ingest and Archiving test case verifies that the EDC DAAC ingests and archives Landsat 7 Level 0R data and associated metadata and browse data received from the LPS as well as inventory information and browse data received from IGSs. The inputs to this test case include Landsat 7 Level 0R data and associated metadata and browse data provided electronically by the LPS as well as inventory information and browse data provided via media by a Landsat 7 IGS. The Test method is used to verify this test case.

The LPS sends the EDC DAAC a data availability notice (DAN), which notifies the ECS that Landsat 7 Level 0R data, Level 0R metadata, and Level 0R browse data are staged and ready for transfer. The DAN includes the following information: the names of the data files, file sizes, and file locations. ECS validates the DAN and schedules to pull the data. ECS then sends a data availability acknowledgement (DAA) message to the LPS indicating the disposition of the DAN.

The EDC DAAC transfers each file from the LPS processor locations specified in the DAN. Each Level 0R data file corresponds to a band/data type for one sub-interval, which corresponds to an uninterrupted Enhanced Thematic Mapper Plus (ETM+) instrument data stream. Each file's name and size is checked against DAN information, and no discrepancies are found. The file transfer result is logged and used in generating the data delivery notice (DDN). The next file is transferred, and the process continues until all files are ingested by the EDC DAAC. Metadata and browse data associated with the Level 0R data are also transferred to the EDC DAAC.

The EDC DAAC transfers the data to working storage. The metadata are extracted and checked with no discrepancies found. The Level 0R data are then archived, and the metadata are stored in the applicable science data inventory. Similarly, the browse data are transferred to working storage. The browse metadata are checked, but no errors are found. The browse data are then archived and the associated metadata stored in the applicable inventory. The EDC DAAC logs ingest and archive information and makes entries into the science data inventory.

When all files have been transferred, ingested and archived, the EDC DAAC sends a DDN to the LPS indicating successful completion of file transfer and archiving.

An IGS provides the EDC DAAC with a tape or disk containing inventory information and browse data for the Landsat 7 data stored at the IGS. The Data Ingest Technician at the EDC DAAC mounts/loads the tape/disk. The inventory information is converted from IGS Standard Format to hierarchical data format (HDF), checked with no discrepancies found, and stored in the applicable science data inventory. The browse data are transferred to working storage and converted. The browse metadata are checked, but no errors are found. The browse data are then archived and the associated metadata stored in the applicable inventory. The EDC DAAC enters ingest and inventory information into the appropriate logs.

The expected results are that the EDC DAAC ingests and archives Landsat 7 Level 0R data and associated metadata and browse data received from the LPS; ingests and archives inventory information and browse data received from the IGS; receives DANs; sends DAAs and DDNs; and updates the appropriate logs.

12.6.5.2 Test Case B120650.020-ECS Interfaces with MOC and IAS

The ECS Interfaces with MOC and IAS test case verifies that the ECS provides the MOC with Landsat 7 metadata, provides the IAS with Level 0R data, and ingests and archives calibration information received from the IAS. The inputs to this test case include ECS tools/displays for requesting Landsat 7 information and products, Landsat 7 metadata and inventory information, and Level 0R products archived in the LPS and IGS Data Ingest and Archiving test case (Section 12.6.5.1). The Demonstration method is used to verify this test case.

The archiving of Landsat 7 metadata triggers a subscription for standing order distribution of metadata to the MOC. The EDC DAAC retrieves the metadata from its archive and transfers the metadata to the MOC. The ECS creates appropriate log entries for these events.

The IAS initiates a search of the Landsat 7 Level 0R inventory as a user. The EDC DAAC accesses inventory information and provides it to the IAS. The IAS enters/modifies the product ordering parameters needed to request distribution of the Landsat 7 products containing the desired scenes. These parameters include the destination site address, log-on identification, and password. The EDC DAAC checks the IAS's distribution inputs for validity and accepts them as valid. The EDC DAAC provides the SMC with a record of the order, which is entered into the data order history database. The EDC DAAC creates log entries for these product ordering events.

The EDC DAAC retrieves, from its archive, the subintervals representing the Level 0R data requested and prepares the appropriate scenes. The EDC DAAC also obtains and prepares associated metadata and queues the scenes and metadata for transfer via FTP. Within 24 hours of the receipt of the product order, the ECS logs on to the IAS site address and transfers the scenes and metadata via FTP. The ECS also sends an e-mail notification of product transfer completion to the IAS and logs off. The ECS creates appropriate log entries for these events.

The IAS, which analyzes the Level 0R data received, provides the resulting ETM+ instrument calibration information and associated metadata to the EDC DAAC. The EDC DAAC ingests this information and transfers the data to working storage. The metadata are extracted and checked with no discrepancies found. The calibration information is then archived, and the metadata are stored. The EDC DAAC logs ingest and archive information.

The expected results are that the EDC DAAC provides the MOC with Landsat 7 metadata; receives IAS requests for Landsat 7 products; provides the IAS with inventory information; validates distribution inputs; retrieves the requested products and associated metadata from the ECS archive; provides the IAS with requested products and associated metadata; ingests and archives calibration information received from the IAS; and creates appropriate log entries.

12.6.5.3 Test Case B120650.030-ECS User Access to Landsat 7 Information and Products

The ECS User Access to Landsat 7 Information and Products test case verifies that the ECS processes user requests for Landsat 7 products and information and distributes the products and information requested. The inputs to this test case include ECS tools/displays for requesting Landsat 7 information and products; Landsat 7 directory, guide, and product cost information; browse data, inventory information, and Level 0R products archived in the LPS and IGS Data Ingest and Archiving test case (Section 12.6.5.1); and calibration information archived in the ECS Interfaces with MOC and IAS test case (Section 12.6.5.2). The Demonstration method is used to verify this test case.

An ECS user accessing the ECS seeks directory and guide information on Landsat 7 products stored at the EDC DAAC. The ECS receives this query, accesses the directory and guide

information previously provided by the Landsat 7 Program, and provides the information to the user.

The user then requests browse data received from the LPS and IGS. The ECS receives the query, retrieves the browse data, and provides the browse data to the user for viewing.

The user also requests ETM+ instrument calibration information received in the ECS Interfaces with MOC and IAS test case (Section 12.6.5.2). The EDC DAAC retrieves this information and provides it to the user. The ECS creates log entries pertaining to these requests.

The user initiates a search of the Landsat 7 Level 0R inventory. The EDC DAAC accesses inventory information and provides it to the user. The inventory includes the products provided by the LPS as well as the inventory information provided by the IGS in the LPS and IGS Data Ingest and Archiving test case (Section 12.6.5.1). The ECS indicates to the user that the IGS products included in the inventory are not available through the ECS, since the user must submit orders to the IGS directly. The products provided by the LPS, however, are available at the EDC DAAC.

The user is interested in one Worldwide Reference System (WRS) scene and wants it distributed to him/her via Compact Disk, Read-Only Memory (CD-ROM). Prior to submitting the product order, however, the user requests a cost estimate. The ECS responds with the estimated cost, which the Landsat 7 Mission Management Office (MMO) previously provided to the ECS.

The user then enters/modifies the product ordering parameters needed to request physical media distribution of the Landsat 7 product containing the WRS scene. These parameters include the user's mailing address and e-mail address. The ECS checks the user's distribution inputs for validity and accepts them as valid. The ECS provides the SMC with a record of the order, which is entered into the data order history database.

The EDC DAAC retrieves, from its archive, the subinterval representing the data requested and prepares the appropriate WRS scene. The EDC DAAC also obtains and prepares associated metadata. The ECS creates log entries for these product ordering events.

Within 24 hours from the receipt of the product order, the Data Distribution Technician at the EDC DAAC loads the CD-ROM onto which the requested product and metadata are copied. The tape is packaged and shipped to the user. The ECS also sends an e-mail notification of product shipment to the user. The EDC DAAC logs distribution information and status. The EDC DAAC also generates accounting and resource utilization information and provides this information to the SMC. The SMC generates a bill/invoice associated with the cost of the CD-ROM and related expenses and distributes it to the user.

Prior to receiving the product on CD-ROM, the user submits to the ECS an inquiry requesting status of the product order. The ECS replies with appropriate distribution information.

The expected results are that the EDC DAAC receives user requests for Landsat 7 information and products; provides the user with directory, guide, browse, inventory, and calibration information; validates distribution inputs from the user; retrieves the requested products and

associated metadata from the ECS archive; provides the user with requested products and associated metadata and product status; and creates appropriate log entries.

12.6.5.4 Test Case B120650.040-Support to Landsat 7 Verification Activities

The Support to Landsat 7 Verification Activities test case verifies that the ECS is capable of supporting various verification activities for the Landsat 7/ECS interface and the Landsat 7 mission. The inputs to this test case include the results of the LPS and IGS Data Ingest and Archiving test case (Section 12.6.5.1), the ECS Interfaces with MOC and IAS test case (Section 12.6.5.2), and the ECS User Access to Landsat 7 Information and Products test case (Section 12.6.5.3). The Analysis method is used to verify this test case.

Early interface testing for the Landsat 7 mission is provided by ECS in Release A. Release B extends this testing capability and supports Landsat 7 operations testing and acceptance testing with the LPS, IAS, and MOC. Additionally, Release B supports Landsat 7 pre-launch, satellite verification, instrument verification, and operational phases.

To the extent that the LPS and IGS Data Ingest and Archiving test case (Section 12.6.5.1) and the ECS Interfaces with MOC and IAS test case (Section 12.6.5.2) are verified, the ECS provides ingest and archiving capabilities for Landsat 7 data for pre-launch checkout of instruments and development of initial calibration information. Similarly, to the extent that the ECS User Access to Landsat 7 Information and Products test case (Section 12.6.5.3) is verified, the ECS provides distribution capabilities for these pre-launch and development activities.

The expected results are that the ECS supports early interface testing, operations testing, acceptance testing, and testing during the pre-launch, satellite verification, instrument verification, and operational phases for the Landsat 7 mission.

12.7 Science Data Interoperability Scenario

The Science Data Interoperability Scenario verifies that the ECS provides the capability to access, receive, exchange, process and store assorted data sets and information among ECS DAAC sites and between ECS sites and external systems. The scenario confirms that the ECS can provide a scientist with cross-DAAC, multi-site, coincident data search and retrieval, 'science software' retrieval, on-demand science data product generation, and data product storage in formats compatible with these systems. It describes the sequential process of searching for and accessing input data sets, including automatic acquisition of data and products from other DAACs and any required ancillary data; scheduling and generating products; generating and/or updating metadata descriptions of these products; and storing these products and the new metadata in standard formats within the ECS.

This scenario confirms the capability for ECS users to access NOAA ADC data holdings. Additionally, this scenario verifies 2-way interoperability among the DAACs and between the ECS DAACs and the Version 0 DAACs. An authorized user has access to data/products stored at any applicable data center. The ECS capability to manage data and product location, to process requests for data and products archived and generated at other DAACs, to maintain the status of distributed requests, and to transmit the required data and products to authorized users is

confirmed. ECS users have access to products located at other ECS DAACs (including data sets already migrated from the Version 0 system) and at collocated and non-collocated Version 0 DAACs. Authorized Version 0 users can access ECS products at collocated and non-collocated ECS DAACs.

12.7.1 Science Information Sequence

The Science Information Sequence verifies that the ECS processes, archives, and distributes supporting science data, information, and quality assurance data.

The ECS capability to accept requests from an authorized user accessing the ECS (at the LaRC DAAC, for example) for MODIS science software and documentation, to retrieve the requested information from the GSFC, NSIDC, and EDC DAACs, and to distribute the specified information is confirmed. Similarly, the user requests receipt of MODIS inventories, directories, and browse information. This sequence verifies that the requested information is distributed as specified by the user.

This sequence confirms that the ECS provides users, upon request, with updated metadata resulting from purges, transfers to other site(s), unexpected loss, and updates.

12.7.1.1 Test Case B120710.010-SCF Special Products

The SCF Special Products test case verifies that SCF produced special science data products (Levels 1A through Levels 4) are transmitted to DAACs, along with associated special product information, such as metadata, ancillary data, calibration data, correlative data, documents, and science data production software. In this test special MODIS science data products, as well as associated special product information mentioned above are sent by the MODIS SCF to the GSFC DAAC, which archives these products. An approved user accessing the ECS (at the LaRC DAAC, for example) requests these products and metadata, which the GSFC DAAC possesses and transmits to the user as specified in their request. The ECS then logs information on the receipt, archiving, and distribution of the special science products. The Test method is used to verify these capabilities.

To exercise these capabilities special products produced by a SCF along with associated special product information such as, metadata, ancillary data, calibration data, correlative data, documents, and science data production software are required. A user request from the LaRC DAAC directed to the GSFC DAAC for these special products is also required.

The expected results are that the ECS receives and archives the special products, processes and satisfies the user request, and logs information on the receipt, archiving, and distribution of the special science products.

12.7.1.2 Test Case B120710.020-SCF and QA

The SCF and QA test case verifies the ECS capability to receive and process QA information. In this test, a subscription is already in place for SCF QA of a certain MODIS product. As each product is generated, the GSFC DAAC stages the product for QA and sends an e-mail message indicating product availability to the MODIS SCF. The SCF receives the notification, retrieves

the product, performs QA, and provides the GSFC DAAC with resulting QA information. The GSFC DAAC applies this information to the quality fields of the associated metadata, which are then stored in the product inventory.

This test also confirms the ECS capability to accept metadata problem reports from users and inform the ECS QA staff of the problem. The QA staff assesses these problem reports and, as a result, submits updated metadata which are stored in the product inventory. The QA staff also performs product QA reviews. Updated metadata resulting from these reviews contains product identifier, QA approval field, and other information. The Test and Analysis methods are used to verify these capabilities.

To exercise these capabilities the following messages are used: QA Notification Specification, QA Notification Specification Acknowledgment, Data Quality Request Notification, Data Availability Notice for Data Delivered for QA and Data Availability Notice for Processing Status. Also needed is a data set that the SCF receives via Kerberos File Transfer Protocol (KFTP) for QA.

The expected results are for the GSFC DAAC to notify the MODIS SCF of the availability of products for QA; receive the QA information provided by the MODIS SCF; assess problem reports from users; perform product QA reviews; and update product metadata with new QA information.

12.7.1.3 Test Case B120710.030-Metadata Updates

The Metadata Updates test case verifies that metadata are updated to reflect changes due to: purges, transfers to other sites, unexpected loss, and updates. The Test method is used to verify these capabilities.

In this test, data is purged from a DAAC location. A user tries to obtain these data, but is unable to do so. The metadata indicate that the data have been purged. Next, a data set is relocated to another DAAC, and a user tries to access this data set. The metadata reflect that the data set has been relocated. In another situation, data are accidentally deleted from a DAAC. When a user attempts to retrieve these data, the metadata indicate that the data have been unexpectedly deleted. Similarly, after a data set has been updated, the metadata reflects that the data set has been updated.

The expected results are that the metadata reflect changes which occur as a result of: purges, transfers to other sites, unexpected loss, and updates.

12.7.2 On-Demand Processing Sequence

The On-Demand Processing Sequence verifies that the ECS processes requests for ad hoc product generation specified by authorized users. The capability of the ECS to provide users with information used in preparing special processing requests, to accept production requests, to retrieve the necessary input data, to schedule, coordinate, and execute product generation, to provide processing status, to distribute and archive the products generated, and to maintain product accounting information is confirmed.

12.7.2.1 Test Case B120720.010-MODIS Ad-Hoc Processing

The MODIS Ad-Hoc Processing test case verifies ECS capabilities that apply to on-demand processing services. For example, an authorized user accessing the ECS at the GSFC DAAC submits a request to generate an ad hoc MODIS product and utilizes the ECS-provided information and displays for on-demand processing. The user submits the request, which the ECS analyzes and accepts or rejects. If the request is accepted, then the GSFC DAAC coordinates with sources of ancillary data, schedules ingest of the data and generation of the product specified by the user, and adjudicates the schedule with the SMC and other affected sites, as necessary. The ancillary data does not arrive as scheduled, so the GSFC DAAC notifies the SMC. Before the problem is adjudicated and the ancillary data are ingested, the user requests a status of the on-demand processing request. The ECS provides the user with the appropriate status. The ancillary data are ingested, the requested product is generated and transmitted to the user as requested, and the GSFC DAAC provides the SMC with product generation and product delivery information on the MODIS product generated, archived, and distributed. The authorized user then searches, accesses and views the ad-hoc MODIS product generated. The Test method is used to verify these capabilities.

To exercise these capabilities an on-demand request for data processing is made to the ECS, as well as a request for the status of the data processing request. Also, the delivery of ancillary data for processing is delayed so the adjudication is verified.

The expected results are: generation of on-demand products, transmission of product generation to the user, and delivery of products to the user.

12.7.2.2 Test Case B120720.020-ASTER GDS and ECS Product Generation

The ASTER GDS and ECS Product Generation test case verifies the capability of the ASTER GDS to interoperate with ECS so that an EOSDIS user or an ASTER GDS user is able to view the data holdings of the other system. Furthermore, this test case verifies the ability of the ECS to receive, from the ASTER GDS, product generation requests or product requests for ECS data products. The user submits the request, which the ECS analyzes and accepts or rejects. The product generation request includes an associated product distribution list. These requests are passed directly from the ASTER GDS to the ECS. The test case verifies that an ASTER GDS user submits a product generation status to the ECS and the ASTER GDS receives a product delivery status message and forwards it the user. Furthermore, this test case verifies that ancillary data sets and associated metadata from the ASTER GDS are provided to ECS on request and used as input to perform product generation. This test case also verifies the ECS and the ASTER GDS are capable of submitting product requests or product generation requests to each other for data sets, such as Level 1b - Level 4 products from ASTER GDS, Level 0 - Level 4 data and products from the ECS, and ancillary and correlative data to support product generation. The Test method is used to verify these capabilities.

To exercise these capabilities requests for product generation, product generation status, or products are generated both from ECS and the ASTER GDS.

The expected results are for the authorized user to receive products requested via product generation requests or other products requested, such as documents, Level 0 - Level 4 data and products, metadata, ancillary data, calibration data, correlative data, 'science software', spacecraft and instrument logs, product status dialog, and the requested product orders from the appropriate DAACs. Also, the user is expected to receive status of products that are being generated.

12.7.3 ECS User Access of Non-Collocated Data Sequence

The ECS User Access of Non-Collocated Data Sequence verifies that a user accessing the ECS at a given DAAC has access to data/products stored at any other applicable data center. This applies to ECS DAACs, all Version 0 DAACs, and the NOAA ADC. (ECS user access to ASTER GDS data/products is described in the ASTER DAR Product Access Sequence (Section 12.3.4). Additionally, the capability for ECS users to access data/products not archived at their local DAACs results in many combinations of interfaces and data transfers, so this sequence includes just a representative set.)

Two-way interoperability among the ECS ASF, ORNL, and SEDAC DAACs are highlighted in this sequence since they are, in a sense, special DAACs with limited, or specially provided, ECS capabilities. Specifically, the ECS provides no product generation capability at the ASF, ORNL, and SEDAC DAACs (unlike the other DAACs); no product archiving (just metadata storage) capability at the ORNL DAAC; and no archiving capability of any kind at the SEDAC DAAC. Thus, verifying mutual access to products archived at each of these DAACs provides confidence that the ECS interoperates properly with the non ECS portions of these DAACs. The GSFC DAAC is also included herein as a representative of the six product-generating and archiving DAACs (GSFC, LaRC, MSFC, EDC, NSIDC, and JPL) with which the special DAACs must interoperate.

This sequence verifies that the ECS provides authorized users the capabilities to access coincident data at non-collocated DAACs, and provides the requested products to the user. Also, the cross-DAAC search and access capabilities among the ECS DAACs is confirmed. Furthermore, unauthorized users are denied access to information that they are not privileged to obtain. The capability of the ECS to support an ECS user’s request for information and products from Version 0 DAACs, as well as deny access to unauthorized Version 0 (V0) users, is verified. This sequence confirms that the ECS supports ECS authorized user access to NOAA/Satellite Active Archive (SAA) and NMC data holdings and prevents unauthorized ECS user attempts to access SAA and NMC data.

12.7.3.1 Test Case B120730.010-Interoperability with Non Product-Generating DAACs

The Interoperability with Non Product-Generating DAACs test case entails interoperability among the GSFC, ASF, and ORNL DAACs and SEDAC. The GSFC DAAC represents a product-generating DAAC, and the other three sites are unique, non product-generating data centers. This test case verifies that the ECS provides the capability for an authorized user accessing the ECS (at the GSFC DAAC) to receive data products archived at the ASF and ORNL DAACs and SEDAC. The ECS capability for an approved user accessing the ECS (at the ASF

DAAC) to receive data/products archived at the GSFC and ORNL DAACs and SEDAC is confirmed. An authorized user accessing the ECS (at the ORNL DAAC) receives data/products archived at the GSFC and ASF DAACs and SEDAC. The ECS capability for an approved user accessing the ECS at SEDAC to receive data/products from the GSFC, ASF, and ORNL DAACs is also confirmed. The Test method is used to verify these capabilities.

The inputs to this test case consists of: 1) requests from the GSFC DAAC by a valid user for data products archived at the ASF and ORNL DAACs and SEDAC; 2) requests from the ASF DAAC by a valid user for data products archived at the GSFC and ORNL DAACs and SEDAC; 3) requests from the ORNL DAAC by a valid user for data products archived at the GSFC and ASF DAACs and SEDAC; and 4) requests from SEDAC by a valid user for data products archived at the GSFC, ASF, and ORNL DAACs.

The expected results are for the authorized user to receive: documents, L0-L4, metadata, ancillary data, calibration data, correlative data, 'science software' , spacecraft and instrument logs, product status dialog, and the requested product orders from the desired DAAC locations.

12.7.3.2 Test Case B120730.020-ECS Users and CERES, LIS Data

The ECS Users and CERES, LIS Data test case verifies that an ECS user can perform cross-DAAC search and access. For example, an authorized user accessing the ECS at the GSFC DAAC needs cloud and lightning data contained in the ECS archives at LaRC and MSFC DAACs, respectively. Once the GSFC user submits separate queries for directory, browse, and guide information for CERES and LIS data, the ECS processes the request and provides the information contained at the different DAAC locations, LaRC and the MSFC. Next, the user requests an inventory of CERES and LIS data holdings. The user then requests access to coincident CERES and LIS products. This test case verifies that the ECS provides the capabilities to access coincident data at non-collocated DAACs, and provides the requested products to the user. The Test method is used to verify these requirements.

The inputs to this test case are an authorized user, an unauthorized user, as well as the queries submitted by the authorized user for directory, browse, and guide information.

The expected results are that the ECS processes the user’s requests by accessing the inventories located at different sites and provides the desired information to the authorized user. The other expected results are that the unauthorized user is denied access to the ECS data holdings.

12.7.3.3 Test Case B120730.030-ECS Users and V0 Data

The ECS Users and V0 Data test case verifies that an ECS user requests information and products from V0 DAACs. For instance, an authorized user accesses the ECS at the GSFC DAAC and is permitted to search and request data contained in the V0 system. The authorized user submits separate queries for browse, guide, and inventory information on ERBE data, which is contained in the V0 system. The ECS passes the user requests to the Version 0 system at the LaRC DAAC, since the ECS maintains information on Version 0 data holdings at each DAAC, and since ERBE data are archived at the LaRC DAAC. Also verified is the ECS capability to receive the results from the Version 0 DAAC, and to forward these results to the user.

Next, the authorized ECS user requests access to an ERBE product contained in the inventory results. This test case verifies that the ECS passes the request for the ERBE product to the Version 0 LaRC DAAC. The Version 0 system sends the product directly to the user either on physical media or electronically per the user's request. The Test method is used to verify these requirements.

This test case also confirms that unauthorized ECS users are denied access to Version 0 data. The inputs to this test case are an authorized user account, an unauthorized user account, the requests for browse, guide, and inventory data contained in the V0 DAACs, as well as the inventory results which the user uses to make data selections.

The expected results are for the ECS to provide the authorized user access to V0 data and products; pass the request for ERBE information and products to the V0 system; forward browse, guide, and inventory information received from the V0 system to the user; and deny access to the unauthorized user.

12.7.3.4 Test Case B120730.040-NOAA SAA and NMC Ancillary Data

The NOAA SAA and NMC Ancillary Data test case verifies the capability of the ECS operators to poll, archive and process NOAA SAA and NMC ancillary data sets used to generate standard products. The SAA and NMC provide ancillary data sets in mutually agreed upon formats and service level agreements to the ECS. For example, the ability of the NMC to provide ECS with a list of operationally available data sets and for ECS to poll on a regular basis the designated NMC ancillary file list for those files needed for standard product generation is verified. The Test method is used to verify these capabilities.

To exercise these capabilities NOAA SAA ancillary data products are made available to the ECS for use in standard product generation. Also, the ECS polls the NMC for the availability of ancillary data products the ECS does not yet possess. Once the ancillary products are found, the ECS ingests the data via FTP for use in standard product generation. NOAA NMC ancillary data products are provided to the ECS as they become available.

The expected results are for the ECS to: 1) receive and archive ancillary data products from the SAA and NMC, and 2) use the ancillary data to produce and then archive the standard data products.

12.7.3.5 Test Case B120730.050-NOAA SAA and NMC Data Products

The NOAA SAA and NMC Data Products test case verifies the capabilities of authorized ECS users to access NOAA/SAA and NMC data holdings. An authorized user accesses the ECS at the LaRC DAAC and is allowed to receive satellite, retrospective and in-situ products from NOAA data centers and archives. This test case verifies that the ECS provides the capability for the authorized ECS user to search and request data archived at the SAA and NMC. The user submits separate queries for browse, guide, and inventory information on SAA and NMC data. The ECS passes the user request for SAA data to the SAA data center, and for NMC data to the NMC data center. The ability of the ECS to transmit browse, guide, and inventory requests to the appropriate data centers, receive the results from these data centers, and forward the results

directly to the user is confirmed. The authorized user requests access of an SAA and NMC product contained in the inventory results. This test case verifies that the ECS passes the request to the SAA and NMC data centers. These data centers send the products directly to the user. Also, this test case verifies that unauthorized ECS users are denied access to SAA and NMC data. The Test method is used to verify these capabilities.

To exercise these capabilities NOAA users submit requests to ECS for: data holdings, guide queries, inventory queries, browse information, cost estimates, user authentication, products and product delivery status. Also, ECS users access the NOAA SAA and submit requests for data holdings, guide queries, inventory queries, browse information, cost estimates, user authentication, products and product delivery status to exercise the SAA-to-ECS interface.

The expected results are the receipt by the requesting system of the expected results such as guide query results, inventory query results, browse results, cost estimate, user authentication information, product delivery status, as well as, enhanced interoperability features.

12.7.4 Non-ECS User Access of ECS Data Sequence

The Non-ECS User Access of ECS Data Sequence verifies that non-ECS users have access to data/products stored at any ECS DAAC. Users accessing Version 0 DAACs are included. (ASTER GDS user access to EDS data/products is described in the ASTER DAR Product Access Sequence (Section 12.3.4). Additionally, the basic capability for a non-ECS user to access any ECS DAAC results in many combinations of interfaces and data transfers, so this sequence includes just a representative set.) This sequence verifies that the ECS provides the capability for the authorized Version 0 user to search and request data contained in the ECS.

12.7.4.1 Test Case B120740.010-V0 Access to ECS

The V0 Access to ECS test case verifies that the ECS provides an approved user accessing Version 0 (at the GSFC DAAC, for example) with the capability to request CERES and LIS data. The user submits separate queries for browse, guide, and inventory information on CERES and LIS data. The Version 0 GSFC DAAC then passes the user requests to the ECS. The ECS capability to receive the browse, guide, and inventory requests, to search the LaRC and MSFC DAACs for the requested information, and to transmit the information to the Version 0 system at the GSFC DAAC is confirmed. The authorized user requests access to the CERES and LIS products contained in the inventory results. The Version 0 system passes the request to the ECS.

To exercise these capabilities multiple CERES, LIS and the associated predictive and definitive orbit data sets are ingested into the LaRC and the MSFC DAACs.

The expected results are that the ECS receives the request from the V0 client, retrieves the CERES and LIS products from the LaRC and MSFC DAACs, respectively, and sends the products directly to the user either on physical media or electronically per the user's request.

12.8 System Performance Scenario

The System Performance Scenario demonstrates overall ECS performance capabilities, as well as, the ability of the ECS to expand and evolve without changes to design. The focus is on ECS performance measures which are affected by the aggregate performance among several sites. An example is the ECS end-to-end response time in commanding an instrument to return core data. Other performance measures verified are the ability of ECS to: ingest and archive at triple the average daily rate of science data, handle transactions and processing within prescribed response time envelops, confirm the archiving capacity of DAACs, and distribute data within the required times.

The performance requirements, as specified in ECS documentation, are verified under specified operational conditions. The emphasis is on testing in a simulated or near real operational environment, typifying moderately loaded and busy system conditions. Response time, archiving capacity and expansion capability performance measures are emphasized.

The scenario verifies the ECS capability to generate and gather statistics and measure performance pertaining to DAAC operations and end-to-end message traffic. Measurement and analysis of the message traffic, resource utilization and operational statistics are used to confirm ECS system performance.

12.8.1 Data Ingest, Data Server and Data Distribution Performance Sequence

The Data Ingest, Data Server and Data Distribution Performance Sequence demonstrates the capability of the ECS to ingest, archive, and retrieve high rate data messages and data traffic. This sequence demonstrates that ECS ingests the maximal bandwidth of science data from a L0 data facility and also receives and handles triple the average daily rate of science data. This sequence confirms: the archiving capacity of the DAACs, the ECS capability to archive triple the average daily rate of science data, the capability of users to retrieve these data within required times, and the DAACs capability to provide twenty-four hour, seven day per week access to ECS services.

This sequence demonstrates that each DAAC has the required capacity to respond to contingencies, scheduling problems and peak loads. This sequence also verifies that the DAACs provide the capability of: archiving three days worth of data in any given day, ingesting data at the maximum output bandwidth of the EDOS, and providing archival capacity for current volume requirements plus one year. This sequence also verifies that ECS provides the reprocessing of EOS science data at twice the incoming data rate at a minimum, concurrently with the processing of new data.

This sequence also confirms the ECS capability to archive original TRMM standard products (L1B-3) after reprocessing for six months. After six months the products become eligible for deletion.

12.8.1.1 Test Case B120810.010-High Data Rate Ingest, Archiving and Retrieval

The High Data Rate Ingest, Archiving and Retrieval test case verifies ECS ingest, archiving and retrieval performance requirements. The capability of each DAAC to retrieve for distribution the

archived data within required response times is tested. Analysis and Test methods are used to verify that the ECS is capable of supporting data operations 24 hours per day, 7 days per week. It is also verified that each ECS operations elements support end-to-end test and verification activities during the pre-launch, spacecraft verification and instrument verification phases. Also, each DAAC provides archiving capacity for the current volume plus one year. The ability of ECS to store the EDOS production data for one year is verified in this test case. Also, the ability of ECS to respond to contingencies, scheduling problems and peak loads is tested. The Demonstration, Test and Analysis methods are used to verify these capabilities.

To execute this test case, a set of mission profiles describing the data types, rates and duty cycles, with estimates of the likely daily maximal data rates of these data, are needed. Information on the communication network maximal bandwidths are also necessary to assure that these limits are stressed, but not exceeded. Also required are simulated data driver software to generate simulated high rate data streams of required data type mix and format(s) to perform these tests. A summary list of required data retrieval response times for each DAAC is also needed as a performance measure of archiving retrieval capability. Also required are a summary of operational and test support requirements and scenarios for mission pre-launch and instrument check-out phases. Benchmark tests and standard data sets are used.

The expected results are confirmations of the ECS ability to handle the maximum bandwidths of data from the EDOS, SDPF and other L0 data sources. Additional expected results from this test case are system performance indicators and performance statistics confirming that the ECS and the respective DAACs ingest and archive data at these maximal rates, retrieve these data within required response times and support mission operations and check-out activities on an ongoing basis.

12.8.1.2 Test Case B120810.020-Ingest and Archiving of Triple the Average Daily Data Rate

The Ingest and Archiving of Triple the Average Daily Data Rate test case verifies the ECS DAAC capability to ingest data from the SDPF or the TSDIS at triple the average daily rate and to archive this amount of data per day. The capability to retrieve these data within required response times is also tested. If triple the average daily rate requires exceeding the maximal ingest rate, then the maximal ingest rate for one day's duration is tested. If triple the average daily rate is much less than the maximal rate, the total required data is ingested at the maximal rate until three times the daily volume of data is ingested. Also, the ability of ECS to ingest data at the maximum output bandwidth of the EDOS, as well as, archive three days worth of data is verified. The ability of ECS to make archive data available to the network for delivery in ECS standard format within an average of two minutes after receipt of a request for the data and within an average of five minutes for a 'different' ECS standard format is verified. Analysis and Demonstration are the primary methods used to confirm these capabilities.

To execute this test case, a set of mission profiles describing the data types, rates and duty cycles, with estimates of the maximal and average daily data rates for these data per DAAC, are needed. Information on the communication network maximal bandwidths are also necessary to assure that these limits are not exceeded. Also required are simulated data driver software to generate

simulated high rate data streams of required data type mix and format(s) to achieve three times the average daily data rates for each DAAC from each L0 facility for each experiment. A summary list of required data retrieval response times for each DAAC is used as a performance measure of archiving/retrieving capability. Benchmark tests and standard data sets are used.

The expected results from this test case are confirmation that each DAAC ingests and archives data at up to three times the average daily rates and retrieves these data within required response times. The capability to archive within 24 hours the 'triple the average daily rate' data stream is required to assure that the DAACs keep up with this high data rate ingest for an extended period, if necessary.

12.8.1.3 Test Case B120810.030-GSFC DAAC Data Reprocessing Support and Archiving

The GSFC DAAC Data Reprocessing Support and Archiving test case verifies that two days worth of archived ancillary data are sent by ECS via standing order and that other data (VIRS level 1A, level 1B to 3B and browse) are sent upon user request to TSDIS for reprocessing. The expected results are the successful daily transmission of an average of two days worth of ancillary and correlative data and other data needed for reprocessing of data sets to TSDIS where reprocessed products are created. Reprocessed data products include: level 1A, level 1B to 3B, and browse data. Following the creation of reprocessed data products, the ECS ingests, on the average, two days worth of reprocessed data from TSDIS. The ability to reprocess data at twice the incoming data rate (at a minimum) while concurrently processing new data is confirmed. This test case also verifies that after reprocessed standard TRMM products are archived for six months, the products become eligible for deletion. The Test method is used to verify the reprocessing and archiving of the data products. Benchmark tests and standard data sets are utilized.

This test case also confirms that the GSFC DAAC reprocesses MODIS and COLOR data at twice the incoming data rate while simultaneously processing new data.

To exercise the TSDIS reprocessing support capabilities, standing orders are submitted for VIRS ancillary and correlative data and user requests are submitted for data sets desired for reprocessing from the GSFC DAAC. Once the required data are retrieved by TSDIS, TSDIS reprocesses the data. The reprocessed data products are then retrieved (via file transfer) and archived by the GSFC DAAC. Users search for and request the reprocessed products.

To exercise reprocessing MODIS and COLOR data, a data loss of higher-level data is simulated, and then the MODIS and COLOR data are reprocessed from the archived data. Users search for and request the reprocessed products.

12.8.1.4 Test Case B120810.040-MSFC DAAC Data Reprocessing Support and Archiving

The MSFC DAAC Data Reprocessing Support and Archiving test case verifies that ancillary and correlative data concerning PR, TMI, GV and SSM/I are sent by ECS via standing order and other data (level 1A, levels 1B to 3B and browse) are sent upon user request to TSDIS for reprocessing. The expected results are for ECS to deliver daily to TSDIS an average of two days worth of archived ancillary and correlative data and other data needed for reprocessing of PR, TMI, and GV data sets. Using these data sets TSDIS creates data products. Reprocessed data

products include: level 1A, level 1B to 3B, and browse data. Following the creation of reprocessed data products, ECS ingests daily an average of two days worth of reprocessed data from TSDIS.

The ability of the ECS to retrieve archived LIS data for reprocessing is confirmed. The ability to reprocess the LIS data at twice the incoming data rate (at a minimum) while concurrently processing new data is verified. The Test method is used to verify the reprocessing and archiving of the data.

To exercise these capabilities, standing orders are submitted for PR, TMI, GV and SSM/I ancillary and correlative data sets and user requests are submitted for other data sets required for reprocessing from the MSFC DAAC. Benchmark tests and standard data sets are utilized.

Once the required data are retrieved by TSDIS, the data are reprocessed at TSDIS. The reprocessed data products are retrieved (via file transfer) and archived by the MSFC DAAC where users then search for and request the reprocessed products.

12.8.1.5 Test Case B120810.050-LaRC DAAC Data Reprocessing Support and Archiving

The LaRC DAAC Data Reprocessing Support and Archiving test case verifies the ability of the ECS to retrieve archived CERES, MISR, MOPITT, ACRIM, and SAGE III data for reprocessing. The ability to reprocess the CERES, MISR, MOPITT, ACRIM, and SAGE III data at twice the incoming data rate (at a minimum) while concurrently processing new data is confirmed. Once the data are reprocessed, the data is archived for users to access. The Test method is used to verify the reprocessing and archiving of the data. Benchmark tests and standard data sets are utilized.

To exercise the reprocessing of CERES data, a data loss of CERES level 1B data at the LaRC is simulated. The LaRC DAAC retrieves CERES data from its archive, reprocesses these data, and archives the resulting products. Then users search for and request the reprocessed products.

Similarly, lower-level MISR, MOPITT, ACRIM, and SAGE III data are retrieved from the archive at the LaRC DAAC and reprocessed. The resulting products are then archived, and users search for and request the reprocessed products.

The expected results are for the LaRC DAAC to retrieve CERES, MISR, MOPITT, ACRIM, and SAGE III data for reprocessing and reprocess these data at twice the incoming data rate while concurrently processing new data.

12.8.1.6 Test Case B120810.060-EDC DAAC Data Reprocessing Support and Archiving

The EDC DAAC Data Reprocessing Support and Archiving test case verifies the ability of the ECS to retrieve archived ASTER and MODIS data for reprocessing. The ability to reprocess the ASTER and MODIS data at twice the incoming data rate (at a minimum) while concurrently processing new data is confirmed. Once the data are reprocessed, the data is archived for users to access. The Test method is used to verify the reprocessing and archiving of the data. Benchmark tests and standard data sets are utilized.

To exercise reprocessing, a data loss of ASTER data at the EDC DAAC is simulated. The EDC DAAC retrieves ASTER data from its archive, reprocesses these data, and archives the resulting products. Then users search for and request the reprocessed products.

Similarly, MODIS data are retrieved from the archive at the EDC DAAC and reprocessed. The resulting products are then archived, and users search for and request the reprocessed products.

The expected results are for the EDC DAAC to retrieve ASTER and MODIS data for reprocessing and reprocess these data at twice the incoming data rate while concurrently processing new data.

12.8.1.7 Test Case B120810.070-NSIDC DAAC Data Reprocessing Support and Archiving

The NSIDC DAAC Data Reprocessing Support and Archiving test case verifies the ability of the ECS to retrieve archived MODIS data for reprocessing. The ability to reprocess the MODIS data at twice the incoming data rate (at a minimum) while concurrently processing new data is confirmed. Once the data are reprocessed, the data is archived for users to access. The Test method is used to verify the reprocessing and archiving of the data. Benchmark tests and standard data sets are utilized.

To exercise reprocessing, a data loss of MODIS data at the NSIDC DAAC is simulated. The NSIDC DAAC retrieves MODIS data from its archive, reprocesses these data, and archives the resulting products. Then users search for and request the reprocessed products.

The expected results are for the NSIDC DAAC to retrieve MODIS data for reprocessing and reprocess these data at twice the incoming data rate while concurrently processing new data.

12.8.1.8 Test Case B120810.080-JPL DAAC Data Reprocessing Support and Archiving

The JPL DAAC Data Reprocessing Support and Archiving test case verifies the ability of the ECS to retrieve archived SeaWinds, DFA, and MR data for reprocessing. The ability to reprocess the SeaWinds, DFA, and MR data at twice the incoming data rate (at a minimum) while concurrently processing new data is confirmed. Once the data are reprocessed, the data is archived for users to access. The Test method is used to verify the reprocessing and archiving of the data. Benchmark tests and standard data sets are utilized.

To exercise reprocessing, a data loss of SeaWinds data at the JPL DAAC is simulated. The JPL DAAC retrieves SeaWinds data from its archive, reprocesses these data, and archives the resulting products. Then users search for and request the reprocessed products.

Similarly, DFA and MR data are retrieved from the archive at the JPL DAAC and reprocessed. The resulting products are then archived, and users search for and request the reprocessed products.

The expected results are for the JPL DAAC to retrieve SeaWinds, DFA, and MR data for reprocessing and reprocess these data at twice the incoming data rate while concurrently processing new data.

12.8.1.9 Test Case B120810.090-Multiple Data Reprocessing Request

The Multiple Data Reprocessing Request test case verifies the ECS DAAC capabilities to send to TSDIS and to the SDPF multiple messages requesting reprocessing of Level 0 data. The

expected results are verification of the DAAC-L0 processing facility interfaces for data reprocessing requests. The Test method is used to verify these capabilities.

To exercise these capabilities simulated data processing request messages and a script to generate multiple data reprocessing request messages are used. Benchmark tests and standard data sets are used.

The expected results are for the DAACs to send and receive acknowledgments to multiple data reprocessing request messages.

12.8.2 System Response Time Performance Sequence

The System Response Time Performance Sequence demonstrates the capability of the ECS to perform client server transaction handling and processing within prescribed response time envelopes. These tests confirm the ECS capabilities to handle the daily specified data volume, processing load, and storage volume requirements; to distribute data via physical media at a rate equivalent to the rate data are ingested; to perform specified numbers of log-ons per hour, single and multiple keyword searches per hour, and status checks per hour; and to distribute product QA data within one hour from the time it is ready. The ability of ECS users to perform the required maximum number of browse data retrievals, document searches and order submissions and confirmations per hour is also confirmed. The ECS capability to generate and distribute Level 1 through Level 4 standard data products within prescribed times is also tested.

This sequence demonstrates the capability of the ECS to perform key data access, processing, transmission and retrieval functions within required response time envelopes. Response time performance is verified for receipt of, and response to, these multiple data messages. The capability to provide archive data in the ECS standard format and in a different ECS format available to the network within the required times is verified. The capability of the DAACs to receive Level 0 data transfers in an operational environment and the capability to receive data is also verified.

This sequence also verifies that the performance management function provides the capability to evaluate the performance of communication resources and interconnection activities including trend analysis for prediction of loading and bottlenecks/delays. This sequence also verifies that the ECS LAN provides the capability to perform the following: generate/collect network statistics, control collection/generation of network statistics, store system statistics and statistical histories, display the system statistics, and track end-to-end transaction performance.

This sequence also verifies the capability of each DAAC, the SMC, the LSM and the EOC to gather statistics such as trend analysis and performance measures pertaining to multi-DAAC operations and end-to-end message traffic. The status data gathered by each site are sent to the SMC for subsequent analysis. This sequence confirms the SMC responds to system faults and security compromises within the prescribed response times. This sequence confirms the capability to transfer integration, testing, simulation, maintenance, logistics and training status data and data orders to the SMC. This sequence also tests the capability to transfer to the SMC resource usage data, including CPU utilization, user storage, connect time and session history data.

This sequence verifies performance requirements concerning the EOC and the following resources/elements: EDOS, DAACs, preliminary resource schedule, detailed activity schedule,

TOO, late schedules, SCC commands and tables, integrated load and/or real-time instrument command, memory loads, emergency/contingency situations, real-time emergency commands, display updates, as well as, those performance requirements relating to the observations that may or may not impact previously scheduled activities. Furthermore, those performance requirements relating to rates to process real-time data, rates to receive and record spacecraft recorder data, rates to process history and archived spacecraft recorder data are verified.

This sequence also confirms that ECS elements provide benchmark tests and standard test data sets for the revalidation of functional performance requirements, as well as, provide the capability to validate at any time during the life time of ECS that the ECS element primary functional performance is consistent with pre-defined operational benchmark tests. Furthermore, this sequence verifies the capability of ECS elements to support end-to-end test and verification activities of the EOS program including during pre-launch, spacecraft verification, and instrument verification phases.

12.8.2.1 Test Case B120820.010-Client-Server Response Time Performance

The Client-Server Response Time Performance test case verifies the required capability of the ECS to perform client-server transaction handling and processing within prescribed response time envelopes. This test case verifies the ECS capabilities to handle the daily specified data volume, process load and storage volume requirements; support instruments and data traffic; perform the specified numbers of log-ons per hour; single and multiple keyword searches per hour; directory, guide, inventory, browse and document searches per hour; specified number of order submissions per hour; and status checks per hour within the required response times. The ECS capability to generate and make available to users Level 1 through Level 4 standard data products within specified time periods is also confirmed.

Also, the ability of ECS to ingest data at the maximum output bandwidth of the EDOS, as well as, archive three days worth of data is verified. The ability of ECS to make available to the network for delivery, archive data in ECS standard format within an average of two minutes after receipt of a request for the data and within an average of five minutes for a 'different' ECS standard format is verified. The Test, Demonstration and Analysis methods are used to verify these capabilities.

The inputs for this test case consist of a summary of ECS client-server loads and response time requirements, relevant operational scenarios for which these requirements are applicable, and simulation software to generate multiple client-server messages in accordance with the relevant operational scenarios. A test script generating sequential log-ons, keyword searches, status checks, browse data requests and retrievals, document searches and order submissions is also required.

Expected results include the confirmation that the ECS satisfies specified numbers of client-server interactions within required response time parameters. Expected results from this test case also are confirmation that the ECS supports daily data volume, processing load and storage volume requirements and meets required client-server transaction volume and response time performance for likely operational scenarios and operating conditions. Furthermore, expected results include the ability of ECS to respond to each user session operations within the time period specified in the Table 12-3, and to maintain this performance when other operational activities, such as database updates, are occurring.

Table 12-3. ECS User Load and Concurrent Session Characteristics

Session Category	Number of IMS Operations per Hour	Specific Operation	Response Time Requirement	Response Time Design Goal
Log-on and Authorization	100	Account confirmation and authorization	13 sec	6 sec
Directory Search	80	Search by single keyword attribute	8 sec	2 sec
		Search by multiple keyword and time or space range check	13 sec	7 sec
Guide Search	40	Search for document by keyword	8 sec	5 sec
Inventory Search	120	Search one instrument by multiple keyword attribute w/time or space range check (one DAAC)	8 sec	2 sec
		Search multiple instruments by multiple keyword attributed w/time or space range check (one DAAC)	18 sec	7 sec
		Multiple DAAC inventory search by keyword attributes and time and/or space range check	58 sec	11 sec
Status Check (account or request)	60	Status of pending order or Data Acquisition Request	13 sec	10 sec
		Account status retrieval	13 sec	6 sec
Browse *(for data selection)*	50	Retrieve and begin to display standard pre-computed browse product	58 sec	
Document Search	10	Search 1000 document pages by keyword	3 sec	3 sec
Ordering Services	25	Local DAAC order submission and confirmation	13 sec	12 sec
		Remote DAAC order submission and confirmation	38 sec	30 sec
		Order cost estimate	13 sec	12 sec

12.8.2.2 Test Case B120820.020-Data Access, Retrieval and Transmission Performance

The Data Access, Retrieval and Transmission Performance test case verifies the capability of the ECS to perform key data access, transmission and retrieval functions over communication networks at required rates and within required response time envelopes in support of data production and data distribution. These tests verify the DAAC capabilities to send data reprocessing request messages to the EDOS, LPS, TSDIS and the SDPF. The tests verify response time performance for receipt of and response to these data messages. The capability of the DAACs to receive Level 0 data transfers in an operational environment and the capability to receive data availability messages from the TSDIS and the SDPF are also verified. Included are tests to confirm that the ECS contribution to end-to-end loop delay for emergency real-time commands in a typical ECS operational environment is less than 2.5 seconds.

This test case also verifies that the EOC receives real-time data from EDOS up to 1.1 megabits per second (Mbps) and receives TSS Summary reports from EDOS within 90 seconds of completion of the TSS. Also confirmed are the capabilities of the SMC, the MSFC DAAC, the LaRC DAAC, and the GSFC DAAC to receive operations management data from EDOS at up to 50 kilobits per second (kbps). The test also verifies that ECS generates and makes available on physical media (to meet user demand) Level 1 through Level 3 data products within 24 hours of input data availability and Level 4 data products within one week of input data availability. Furthermore, this test case verifies that ECS creates media tapes at a rate equivalent to the level 0 ingest rate.

This test verifies that within 120 seconds of delivery of the PDS to the SMC, the LaRC DAAC or the GSFC DAAC, the EDOS initiates transfer of a PDS delivery record to the SMC, LaRC DAAC or GSFC DAAC, respectively. The test also verifies that within 120 seconds of delivery of the archive data set (ADS) to the SMC, the LaRC DAAC or the GSFC DAAC, EDOS initiates transfer of the ADS delivery record to the SMC, LaRC DAAC or GSFC DAAC, respectively. This test also verifies the SMC receives the EDOS Activity Plan (EAP) within 10 minutes of the initiation of the EAP from EDOS, and the SMC receives EDOS Operations Timeline (EOT) within 10 minutes of the initiation of the EOT from EDOS. Furthermore, the SMC receives an EOT change notification within 30 seconds of initiation of the change at EDOS. Finally, this test case verifies the capability of the LaRC and the GSFC DAACs to initiate transfer of status messages (verification of PDSs messages and ADS delivery messages) to EDOS within 8 hours following the delivery of all PDSs and all ADSs for a 24 hour period. This test case uses Test, Demonstration, and Analysis verification methods.

The inputs for this test case consist of a summary of required messages/requests in the correct formats, a list of system response time requirements, operational scenarios and test scripts to generate simulated message traffic performing the desired ECS access, transmission and retrieval functions.

The expected results are the verification of the ECS to perform data access, data transmission, and data retrieval functions within required response time performance parameters.

12.8.2.3 Test Case B120820.030-Performance Statistics Data Gathering

The Performance Statistics Data Gathering test case verifies the capability of each DAAC, the SMC, the ECS LAN and the EOC to generate and gather statistics to measure performance management pertaining to multi-DAAC operations and end-to-end message traffic. This test demonstrates the capability to transfer integration, testing, simulation, QA, maintenance, logistics, training status data and data orders. This test also confirms the capability to transfer end-to-end resource usage data, including CPU utilization, user storage, connect time and session history data to the SMC. This test case confirms the SMC capabilities to generate requests for performance data, maintain and evaluate a broad array of performance measures, establish performance alert thresholds and generate performance alerts upon detection of system performance degradation. This test case also verifies the SMC capabilities to detect and respond to system faults and system security compromises within 5 minutes. Analysis is used to show that the Planning and Data Processing System (PDPS) has the capacity to support I/O to temporary storage, I/O to intermediate storage or I/O to multiple passes by individual science software algorithms. The Demonstration method is used to show each DAAC distributes QA data to the collocated PDPS within one hour from the time the QA data is produced.

This test also verifies the capabilities of the performance management function to evaluate the performance and capacity of the ECS LAN resources and interconnection activities. The performance management function includes trend analysis for prediction of loading and bottlenecks/delays, generate/collect network statistics, control collection/generation of network statistics, store system statistics and statistical histories, display system statistics, and track end-to-end transaction performance.

The inputs for this test case consist of real or simulated sets of operational data (integration, testing, simulation, maintenance, logistics and training) for exchange among the DAACs, the SMC, the EDOS and the EOC; a script and an operational scenario under which such types of data are exchanged; a set of simulated data orders; and a script for collecting and exchanging resource usage data (CPU utilization, user storage, connect time and session history data); a scenario for generating and collecting resource performance data and system fault and security compromise data, and a tool, such as HPOpenView, to assist in the performance analysis.

The expected results are that the ECS collects and exchanges performance data and statistics among ECS sites to support system performance monitoring, responds to performance anomalies, and generates and tracks data orders. Another expected result is that the PDPS has the capacity to support input and output to temporary and intermediate storage, as well as support multiple passes as required by science software. Also, expected is that the PDPS retrieves QA data from its DAAC within one hour after the data is produced.

12.8.2.4 Test Case B120820.040-EOC Performance

The EOC Performance test case verifies performance requirements concerning the EOC and the preliminary resource schedule, the detailed activity schedule, TOO, late changes, SCC stored instrument commands and tables, integrated load and/or real-time instrument command memory loads, emergency/contingency situations, real-time emergency commands, display updates, as well as those performance requirements relating to the observations that may or may not impact

previously scheduled activities. Performance requirements relating to rates to process real-time data, rates to receive and record spacecraft recorder data, and rates to process history and archived spacecraft recorder data are verified. For example, the EOC processes real-time data at rates of up to 50 kbps per spacecraft, receive and record spacecraft recorder data at rates up to 1.544 Mbps, process history and archived spacecraft recorder data at rates up to 150 kbps.

Specifically, this test case verifies that EOC supports several uplink rates to the spacecraft: 10 kbps S-band single access (SSA), 1kbps S-band multiple access (SMA), 125 bps during contingency operations, and 2kps during emergency operations via S-band DSN link. This test case also verifies the EOC ability to receive and process real time data received as two 16 kbps data streams and record spacecraft recorder data at rates up to 1.544 Mbps using the EDOS rate buffered path service. Furthermore, the ability of EOC to provide CLTUs to SSIM at the following rates: 125 bps, 1 kbps, 2 kbps, and 10 kbps is verified. Also, the ability of the EOC to receive from SSIM the following: two housekeeping telemetry packet streams of 16 kbps, health and safety telemetry packet streams of 1kbps, and diagnostic telemetry/memory dump packet streams of 16 kbps is verified.

The inputs to this test case are: 1) all of those inputs required to generate a preliminary resource schedule and detailed activity schedule for spacecraft such as activity and DAR identifiers, resource availability and usage requirements, time constraints, as well as, TDRSS schedule information, 2) unscheduled commands which reconcile the detailed activity schedule, 3) updates to the detailed activity schedule, 4) the instrument activity list, 5) the instrument activity deviation list, and 6) the detailed activity schedule.

The expected results for the EOC are: 1) the generation of a preliminary resource schedule for a spacecraft within 2 hours after all required inputs are available; 2) the modification of the detailed activity schedule by the EOC within 24 hours of the issuance of unscheduled commands; 3) the update of the detailed activity plan within 1 hour of after receipt of the update to the corresponding instrument activity list or the instrument activity deviation list, if the update does not affect the existing detailed activity schedule events or create new conflicts; 4) the update of the detailed activity plan within 10 hours after receipt of the update to the corresponding instrument activity list or the instrument activity deviation list, if the update affects the existing detailed activity schedule events or create new conflicts; 5) generation by the EOC of SCC-stored spacecraft commands and tables once per day for 24 hours of spacecraft operations in less than 1 hour; 6) prepare the corresponding integrated load and/or real-time instrument command set within 15 minutes of receipt the SCC-stored spacecraft commands, tables, or instrument load from the ICC, if TOO observation or late change does not impact previously scheduled activities and if the observation or change does impact previously scheduled activities; 7) EOC prepare a spacecraft and instrument for transmission to EDOS within one minute of detecting a pre-defined emergency/contingency situation; 8) produce spacecraft and instrument memory loads covering a 24-hour period of spacecraft operations in less than 1 hour; 9) process and output a single real-time emergency command within 500 milliseconds of receiving the request from an ICC; 10) receive and report data quality information with the incoming CCSDS packets as provided by EDOS; 11) respond to operator inputs within 5 seconds; and 12) update rapidly changing displays once per second.

12.8.2.5 Test Case B120820.050-SMC and LSM Performance

The SMC and LSM Performance test case verifies performance requirements concerning the scheduling of ground activities, generating system faults, and generating security compromises. This test case also verifies that the SMC generates, maintains, and updates performance criteria, as well as, appropriate responses to performance deficiencies for system, site, and element resource activities. The ability of the SMC to generate alert conditions of faults or degraded conditions, which include corrective actions, is also verified. The ability of the SMC and LSM to generate, as needed, requests for performance testing is verified. This test case verifies that the LSM implements the performance criteria from the SMC for evaluating element resource performance. Furthermore, the ability of the SMC to establish multiple levels of performance thresholds is verified. The ability of the SMC to perform short term and long term trend analysis of system, site, and element performance is verified. The Test method is used to verify these requirements.

The inputs to this test case include: the set of performance criteria and response time requirements, a set of appropriate responses and corrective actions to performance deficiencies, sample schedules, a summary of required messages/requests in the correct formats, as well as, operational scenarios and test scripts to generate system faults and security compromises.

Expected results are for the SMC and LSM to evaluate their overall system performance against ESDIS criteria. The SMC is expected to schedule ground activities to a minimum of one minute resolution and be able to respond to system faults and security compromises within a maximum of five minutes, as well as generate, maintain, and update performance criteria and responses to performance criteria for activities such as data collection; product generation; QA and validation; reprocessing; data delivery to DAACs and users; response to user requests; response to TOOs; response to field experiments; and response to emergency situations. The SMC is also expected to generate alert indicators of faults or degraded conditions, as well as, appropriate corrective actions. On the other hand, the LSM, generates in response to limit check thresholds alert indicators of fault or degraded conditions. Other expected results are that the SMC establishes multiple levels of thresholds for each performance parameter and the LSM establishes multiple levels of thresholds for each limit checked parameter to include: on/off, pass/fail, and various levels of degradation. The SMC and LSM are expected to generate, as needed, requests for performance testing to include: resource to be tested, test purpose, requested test priority, required test environment, impacts to operations, and expected test results. Furthermore, the SMC/LSM short and long-term analysis includes: operational status, performance of a particular resource, and maintenance activities. The results of the trend analysis include a determination of the impact of: modifying system, site or element activity allocations, potential enhancements to the system site or element.

12.8.2.6 Test Case B120820.060-TRMM CERES Performance

The TRMM CERES Performance test case verifies performance requirements related to TRMM and ECS sites. For example, the LaRC DAAC capability to receive CERES Level 0 data sets once per day within twenty-four hours of the last acquisition session at SDPF is verified. The LaRC DAAC receives notification of availability of a CERES expedited data set within two

hours of the end of the acquisition session at SDPF. The Test method is used to verify these capabilities.

To exercise these capabilities the ECS requires that the SDPF transfers CERES level 0 data to the LaRC DAAC and SDPF sends a notification message of availability of CERES expedited data.

The expected results are for the LaRC DAAC to receive the required data sets and notification messages on or before the specified amount of time has elapsed.

12.8.2.7 Test Case B120820.070-TRMM LIS Performance

The TRMM LIS Performance test case verifies the performance requirements related to TRMM and ECS DAAC sites. For example, the MSFC DAAC receives LIS Level 0 data sets once per day within twenty-four hours of the last acquisition session at SDPF. The MSFC DAAC receives notification of availability of a LIS expedited data set within two hours of the end of the acquisition session at SDPF. The Test method is used to verify these capabilities.

To exercise these capabilities the ECS requires that the SDPF transfers LIS level 0 data to the MSFC DAAC and SDPF sends a notification message of availability of LIS expedited data.

The expected results are for the MSFC DAAC to receive the required data sets and notification messages on or before the specified amount of time has elapsed.

12.8.3 ECS Sizing, Evolution and Growth Sequence

The ECS Sizing, Evolution and Growth Sequence verifies that ECS has the capability to support required requests and grow as demand expands. This sequence also verifies by Analysis method the ECS capability to accommodate an expansion of PDPS capabilities by a factor of 10 without major design changes, and to provide four times the normal processing capability to process relevant EOS science data. These analyses extend beyond estimated capabilities for the Release B through the contract lifetime. Analyses are used to verify the capability of each PDPS site to utilize the full processing capability of that site, including parallel processing and processing of any combination of science software algorithms. This sequence also verifies that the same function is performed at different sites even though they may have different hardware implementations. The sequence also verifies: the ability of ECS to add additional storage capacity to meet discipline and site unique archiving needs, the ability of ECS to expand to gigabyte networks, and the ability for the ECS LAN to expand to meet the specified capacity and growth requirements.

Additional analyses verify that the ECS PDPS has adequate growth and evolution capabilities. Similarly, analyses verify that the PDPS has adequate processing expansion capabilities to handle multiple data loads and to support multiple science software computations. Analysis is used to verify the ECS capability to support science software I/O operations.

Analyses also confirm the capability of the ECS networks to accommodate expansions in required data traffic and data storage and to accommodate interfaces with the Global Change Data and Information System (GCDIS).

12.8.3.1 Test Case B120830.010-Accommodation of ECS Expansion Analyses

The Accommodation of ECS Expansion Analyses test case analyses and verifies the capabilities of the ECS to accommodate an expansion of PDPS capabilities by a factor of 10 without major design changes, and to provide four times the normal processing capability to process relevant EOS science data. Analyses are performed to verify projected PDPS capabilities are adequate through the contract lifetime. Analyses also verify that each PDPS site utilizes the full processing capability of that site, including parallel processing and processing of any combination of likely science software. This test case also analyzes and confirms the capability of the ECS to accommodate growth in instrument processing loads, expand up to three times the processing capacity of PDPS without changing the processing design, and increase the associated storage capacities with no required change in ECS architecture or design. Analysis is performed to show that for sizing purposes the DAAC CPU processing rates are not greater than 25% of the peak-related CPU capacity. Based on data volumes, at-launch instrument processing load requirements assigned to each DAAC and on a 20 % yearly product growth, the Analysis method is used to determine the processing capacity necessary to process EOS science data for each DAAC. Analysis and Test methods are used to confirm that additional storage devices can be added and that an applications program interface (API) is developed and configuration controlled permitting the integration of additional storage devices.

Additional Demonstrations and Analysis verify that the ECS expands to enable GByte networks and their corresponding increased data volume and data distribution requirements. Also, the capability of the ECS LAN to expand to meet these increased data loads is evaluated and confirmed.

The inputs for these analyses consist of the projected processing loads on each PDPS processor and the current and maximal processing capabilities of each site processor. Also needed are a likely mix of science software algorithms, which is executed concurrently at each site and the maximal computational load which each of these algorithms place on the PDPS processor(s). The baseline PDPS design and supporting analyses of the likely expandability of processor capabilities within current and future technologies are needed to assess whether any design modifications are needed to meet expanded processor loads. Additional inputs of projected data volume and data distribution loads and projected network capacities are needed to support network adequacy analyses.

The expected results are verification of the robust and expandable capabilities of the ECS to handle much greater processing and storage loads without requiring redesign. Additional expected results from these analyses are verification by Analysis of the projected capability of the PDPS processing elements to meet up to ten times required capabilities and up to four times normal processing requirements without major redesign efforts.

12.8.3.2 Test Case B120830.020-ECS Growth and Evolution Adequacy Analyses

The ECS Growth and Evolution Adequacy Analyses test case analyzes and verifies the evolutionary and growth requirements of the ECS. The analyses verify that the PDPS evolves to meet the future ECS processing requirements and is able to handle multiple data loads and science software computations and support the required science software input/output operations.

The analyses confirm the capability of the ECS to interface with the GCDIS. Also verified is the ability to spread processing capabilities over different computers providing a 'failsoft' environment. Additional analyses confirm that the ECS hardware, software and interface capabilities provide transparent portability across heterogeneous site architectures.

The inputs for these analyses consist of summaries of the current and future ECS processing requirements, current processor processing capabilities and future technology projections for relevant PDPS type processors. Summary data of GCDIS interface and loading requirements are also needed.

The expected results are the verification by Analysis that the ECS is able to evolve and grow to meet future processing, storage and interfacing requirements. Expected results from these analyses include the verification of the capability for the PDPS to gracefully evolve and grow to meet projected future ECS processing requirements. The capability of the ECS to interface with the GCDIS is also confirmed.

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